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A STUDY OF HEALTH TECHNOLOGY ASSESSMENT IN CANADIAN HOSPITALS

by

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A thesis submitted in conformity with the requirements
for the degree of Master of Health Science in Clinical Engineering
Institute of Biomaterials and Biomedical Engineering
University of Toronto

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A STUDY OF HEALTH TECHNOLOGY ASSESSMENT IN CANADIAN HOSPITALS
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Abstract

The modern hospital has benefited greatly from technological advancement. Healthcare technology provides numerous benefits including increased quality of care, improved patient and staff safety, quicker diagnosis, and reduced incidence of error. Healthcare Technology Assessment (HTA) serves as a decision-making mechanism and planning process to maximize benefits and minimize costs by approving or rejecting technologies under consideration. The aim of this thesis study was to evaluate the current state of HTA in Canadian hospitals. The primary research tool employed in this investigation was a confidential questionnaire (distributed to over six hundred institutions), which sought insight into Canadian hospitals' healthcare technology evaluation processes and experiences with new and emerging diagnostic and treatment capabilities. Analysis of response data revealed major insufficiencies in HTA and a need for process refinement and renovation. In order to meet future advances in biomedical science and technology, adequate and comprehensive HTA processes will be indispensable.

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Glossary of Acronyms

AETMIS – Agence d'évaluation des technologies et des modes d'intervention en santé
BCOHTA – The British Columbia Office of Health Technology Assessment
CBA – Cost-benefit analysis
CCOHTA – Canadian Coordinating Office for Health Technology Assessment
CDRH – Center for Devices and Radiological Health
CEA – Cost-effectiveness analysis
CHA – Canadian Healthcare Association
CIHI – Canadian Institute for Health Information
CT – Computed Tomography
CUA – Cost-utility analysis
DAD – District Access Database
ECRI – formerly Emergency Care Research Institute
EHTO – European Health Telematics Observatory
FDA – Food and Drug Administration
HIS – Hospital Information System
HTA – Healthcare Technology Assessment or Health Technology Assessment
ICU – Intensive Care Unit
IS – Information Systems
IT – Information Technology
INAHTA – International Network of Agencies for Health Technology Assessment
ISTAHC – International Society for Technology Assessment in Health Care
LTC – Long-Term Care
MEDLARS – Medical Literature Analysis and Retrieval System
MRI – Magnetic Resonance Imaging
NCCHTA – National Coordinating Centre for Health Technology Assessment
NICHSR – National Information Center on Health Services Research and Health Care Technology
NIH – National Institutes of Health
NLM – National Library of Medicine
OR – Operating Room
PACS – Picture Archiving and Communications System
QALY – Quality-Adjusted Life Year
RIS – Radiology Information System
RFP – Request for Proposal
RFQ – Request for Quotation
VA – Veterans Administration
WHOSIS – World Health Organization Statistical Information System
Y2K – Year 2000

1. Introduction

1.1 The Hospital and Healthcare Technology

The origins of institutional healthcare lie in ancient civilization – in the Greek *Aesclepieion* ("healing shrine") and the Roman *valetudinarium* (military "hospital") (Risse, 1999). While these primeval establishments were sophisticated, the Middle Ages saw an erosion of the hospital into a charitable organization providing lodging for the dying and impoverished. Early Canadian hospitals were little more than pesthouses where patients met with squalid and crowded conditions and inadequate medical treatment capabilities (Gorrie, 2002). In fact, the birth of Toronto's first hospital (The Toronto General) took the form of a shed containing remaining post-War of 1812 medical equipment (Gorrie, 2002). By the early 1900's, hospitals began the process of evolution to "places that could save lives rather than prematurely end them" (Gorrie, 2002). Having burgeoned under the auspices of medical advancement, the modern hospital effectively addresses the healthcare needs of the population and forms an integral part of the healthcare network (Columbia Electronic Encyclopedia, 2000). Indeed, much has changed since the inception of the hospital in ancient times: modern health-care facilities offer state-of-the-art high technology diagnostic and therapeutic resources. Robotic devices and automated processes are no longer foreign entities in the contemporary hospital (Mullins, 1998).

Much of the recent evolutionary change is technology-driven. Healthcare technology encompasses all of the systems and elements involved in the implementation and maintenance of healthcare: medical devices, equipment, biologics, procedures, pharmaceuticals, vaccines, prevention, diagnosis, therapy, and rehabilitation (INAHTA,

2001; Rettig, 2002; UK Department of Health Research, 2001). Medical technology includes all things related to the application of engineering science techniques to health care problems; technology includes equipment and devices, but is not limited to these. Medical technological development exerts a powerful influence over patient care and health outcomes (Baker, 2000). The impact of healthcare technology is great: numerous lives – those of healthcare professionals, of patients, of long-term users of services, etc. – change as a result of the incorporation of novel clinical procedures, tools and equipment. Reductions in length of stay and in associated costs and improved patient care constitute examples of the effects of modernization of healthcare. Space efficiency – both in terms of physical infrastructure and data storage – also results from the adoption of new medical technology. In Toronto, St. Joseph's Health Centre implemented an Internet-ready data mart and "dramatically shortened the hospital's report generation time, provided an easier way for staff to view information and eliminated thousands of pages of paper, all without compromising the confidentiality of the information" (Sybase, 2001). Furthermore, studies indicate that advancements in healthcare technology over the past quarter-century have led to significant amelioration in the prognoses for patients with heart disease and for neonates at high-risk (Baker, 2000). Granted, even the perception of leading edge technology changes with time. In 1922, "new technology" applied to the acquisition of the motorized ambulance by the Toronto General Hospital (Gorrie, 2002). In this document, the concept of new and emerging technology is taken to reflect current standards and technological advancements of the past decade.

There are several chief characteristics to innovation in the healthcare sector. Some researchers – Rettig, for instance – maintain that it is the sole means of elucidating

answers to clinical problems – both old and new (Rettig, 2002). In addition, advancement serves the function of steering the continual improvement and elaboration of quality in healthcare services. It also propels the inexorable increases in healthcare spending: technological growth may have produced over fifty percent of the increase in recent healthcare spending (Baker, 2000). In fact, it is this latter issue, – cost – which has garnered much attention. The rapid and continuing rise in healthcare costs became a major concern in the early 1990's (Lyons, 2002). Expert consensus was that the introduction of new medical technologies factored significantly into these increased costs. According to Dr. David Banta, president of the International Society of Technology Assessment in Health Care (ISTAHC), the intensified focus on technology is largely a result of rising healthcare costs (ISTAHC, 2001). Healthcare policymakers face pressure to efficiently allocate resources and manufacturers of healthcare technology meet with demands to demonstrate the economic benefit of their products. While it is important to contain costs, compromising the adoption of novel technology is not an acceptable consequence particularly as it relates to the creation and maintenance of quality patient care. Thus, it is important to delineate the implications of utilization of new technology from the point of view of spending as well as patient welfare.

1.2 Healthcare Technology Assessment

The implementation of novel healthcare technology can produce effects – both advantageous and detrimental – of enormous proportions. Adequate planning and establishment of a knowledge base supporting a given technology aids in the reduction of the latter type of consequence. In addition to the aforementioned economically driven interest in healthcare technology evaluation, there are other factors, which contribute to

its importance. Other issues include Quality Control and the notion of technological advancements' ability to improve processes by maximizing efficiency and accuracy. These matters are of vital significance in the medical field, where the procedures and devices are directly employed in the care of human beings.

No equipment, systems, administrative, educational, etc. changes relating to healthcare technology should be made prior to a thorough assessment process and clinical investigation. In addition to exerting a profound influence on the hospital's functioning and feasibility, healthcare technology decisions greatly affect the prime concern of the organization: the lives of its patients. It is crucial that a hospital base its medical technology choices on objective substantiation of the best available kind. It is imperative to appropriately evaluate biomedical technology under consideration for implementation within a hospital and/or clinical setting. This is particularly the case in instances where the technology in question is greatly contentious, publicized, or political.

There is a need for a mechanism through which the decision-making process can maximize benefits and minimize costs either by approving or rejecting the proposed technology. This is the critical function of Healthcare Technology Assessment (HTA). Technology assessment refers to the wide-ranging multidisciplinary form of policy research that analyzes the prospective effects – both short-term and long-term – of technology execution (Health Technology Assessment Glossary, 2001). Vis-à-vis the healthcare industry, this term speaks to the systematic appraisal of the consequences and attributes of healthcare technology. "In short, health technology assessment is a bridge between the world of research and the world of decision-making, particularly policy-making" (Battista and Hodge, 1999).

Healthcare Technology Assessment is a facilitator and tool having evidence-based analysis at is core and the improvement of decision-making and health as its directive. It addresses the needs of those who use and manage healthcare technology. Users include those who interact with the technology either by implementing and administering it or by being subject to and benefiting from it. The assessment process serves as an informative contrivance for the commissioners (including health authorities and practitioners), benefactors, and beneficiaries of healthcare.

Unlike conventional research, the HTA process differs from the former by means of four critical characteristics outlined by Battista and Hodge. These are the following: a focus on application to policy-making; a multi-disciplinary approach to subject and methodology; information synthesis, production of primary data when required, and investigation of database sources; and active communication and distribution of findings and the adaptation of these to meet the needs of various target groups (Battista and Hodge, 1999). The process integrates many fields, utilizing and assimilating knowledge and information particular to each; these include anthropology, biostatistics, business administration, economics, epidemiology, law, medicine, and sociology (BCOHTA, 2001). HTA investigates various aspects – medical, social, ethical, economical, etc. – associated with the development and deployment of healthcare technology. Both qualitative and quantitative research have a place in HTA. Furthermore, this assessment method relies upon the amalgamation of three types of data: scientific, contextual, and historical (Battista and Hodge, 1999). The first is self-explanatory; the latter two refer to the framework – e.g. constraints and parameters, and stakeholder views and values – in which technology evaluation and decision-making take place (Battista and Hodge, 1999).

Refer to §2.2.1.3 Data Mining for additional information regarding data classification. It is important that policy-making be "informed but not limited by scientific tendency to reductionism" and that scientific investigation and analysis be "informed by the needs of the policy-making process", but simultaneously progress without interference from this decision-making procedure (Battista and Hodge, 1999). Scientific evidence and systematic reviews are integral components of HTA, but assessors must position them in the context of decision-making analysis (Battista and Hodge, 1999).

HTA produces "information on the impact of the introduction and use of a specific technology on citizens, patients and on the healthcare organizations including their funding" (EHTO, 2001). The process potentially impacts a number of different domains and can have extensive effects. Among possible outcomes are changes effected in: corporate investment decisions, research and development priorities and budgets, technology marketing strategies, behaviour of healthcare practitioners and/or patients, allocation of healthcare resources on different levels (from regional to national), etc (Banta and Luce, 1993). Specifically in the hospital setting, the main goal of Health Technology Assessment is to serve as a basis for decisions support and policy-making by means of providing impartial and comprehensive analytical information (NICHSR, 2001). In this case, the prime reason for HTA is to influence the acquisition and/or adoption of (or conversely, the decision not to exploit) a specific new and emerging technology.

Healthcare technology has emerged as a critical component in the healthcare sector and marks a global trend: a number of industrialized nations have instituted active HTA programs, usually within focused public organizations (ISTAHC, 2001). As time

progresses, the private sector gains awareness of the importance of HTA, and even developing countries' interest in the process grows (ISTAHC, 2001). A large volume of literature pertinent to diverse technologies exists on the Internet as technology assessment efforts have become widespread on a worldwide basis. The Netherlands instituted an early warning system (EWS) (which provides intelligence regarding the identification of novel healthcare technologies) in 1988, while other countries (including Canada, Denmark, France, Sweden, and the United Kingdom) investigated the development of such a system in the late 1990s (Robert and Gabbay, 1999). While the main mandate of these systems is often to direct the appointment of research priorities for HTA, they also provide notification of forthcoming healthcare technologies to healthcare professionals and other interested groups. Numerous resources and associations devote themselves to HTA. These can be centralized and/or decentralized. In Canada, there are a number of such organizations both government- and academe-based (Rettig, 2002). Chief examples include the Canadian Coordinating Office for Health Technology Assessment (CCOHTA), Agence d'évaluation des technologies et des modes d'intervention en santé (AETMIS) in Quebec, and the Office for Health Technology Assessment in British Columbia (BCOHTA). (Refer to Appendix E – Resources for additional information regarding organizations and Internet resources devoted to healthcare technology.)

1.3 Goals and Value of This Thesis Research

As previously noted, a product of technology assessment is information to guide rational decision-making processes. These address the determination of whether or not to utilize the technology undergoing evaluation. Hitherto, there has been no discussion in this document regarding the appraisal of the Healthcare Technology Assessment process

itself. Evaluation tools for the outcomes of HTA include development of change in clinical practice norms, the "diffusion patterns" of technologies within the hospital sector, the content in published efficacy reviews, the attainment of practitioner and patient commentary, and the measurement of changes in health status (Battista and Hodge, 1999). A primary objective of this thesis research is to evaluate the prevalence and effectiveness of existing HTA processes in Canadian hospitals.

According to Robert and Gabbay (1999), there is no formal established means of identifying new and emerging healthcare technology. A question arises with regard to the ability of hospitals to first discover and subsequently adopt and implement new and emerging technology. In addition, as per the Robert Wood Johnson Foundation Grant Report on "Analysis of Cost Containment Strategies Involving Medical Technology", last updated in January 2002, there remains no policy to guide the evaluation of the total combination of the following factors related to novel medical technology: safety, efficacy and cost-effectiveness. An ensuing query addresses the validity of this statement and asks whether or not this is the case in Canada. The goal of the research upon which this document is based is to determine the extent to which Canadian hospitals incorporate new healthcare technology and to elucidate the scope of their underlying processes of discovery, acquisition and implementation. It also seeks to demonstrate the importance of developing a strategy framework, which takes into account cost analysis and containment, to guide assessment and integration of new and emerging healthcare technologies in healthcare facilities.

Battista and Hodge claim that the greatest feat of HTA is its potential to reveal once more the human facet of health care: they believe that the next step in the

development of the HTA process will involve a modification from mere "simple, linear" distribution of information towards the more complicated and interactive mode of communicating information for the purposes of providing support to the decision-making process (Battista and Hodge, 1999). "For decision-makers at all levels in rapidly changing health care systems, reflecting on the future of health technology assessment is critical in an environment that is increasingly dominated by cost-effectiveness, evidence-based medicine and changing ideas of accountability"(Battista and Hodge, 1999). The thesis research revealed in this document investigates the capacity of current assessment processes in place at Canadian hospitals to effectively inform and support the healthcare decision- and policy- making processes.

As mentioned in the previous section, the incorporation of leading edge technology in the health care sector can produce dramatic effects. Among a number of favourable outcomes are: improved patient care, increased satisfaction on the parts of healthcare providers and patients, and increased organizational efficiency. Technology assessment is a crucial need for Canadian hospitals. The ultimate aim is to understand the process and hopefully contribute to its improvement, expansion and formalization. These goals strive to enhance the quality, efficacy, and suitability of clinical practice by expanding the knowledge base that functions as its basis. Elucidation and comprehension constitute a prerequisite stage in the application of the necessary mechanisms required to maintain and augment the quality of Canadian healthcare.

2. Overview of the Healthcare Technology Assessment (HTA) Process

> "HTA is designed to answer the key questions of commissioners of healthcare, providers and users of services: Does this treatment work? For whom? At what cost? How does it compare with alternative treatments?"
>
> (UK Department of Health Research. 2001)

The Healthcare Technology Assessment Process functions to inform the practice of healthcare decision-making. The current nature of healthcare is such that it benefits from swift biotechnological advances. In order to optimize the implementation and usage of available novel biomedical technologies, their potential and cost must be judiciously evaluated. This chapter outlines the components of this important HTA method, which serves to assess the impact of healthcare technology on patients, practitioners, and society.

2.1 Key Factors for Consideration

It is of utmost importance to identify all of the stakeholders and to involve them in the process of assessing the biomedical technology in question. The fundamental factors for evaluation in HTA include safety, cost, efficacy, effectiveness and efficiency (cost-benefit, cost-effectiveness, or cost-utility) of a technology along with the social, legal, and ethical consequences of its introduction (EHTO, 2001). Of principal import is the evaluation of the potential for the new technology to improve patient care. The following list summarizes the main issues for consideration by a hospital conducting HTA (CCOHTA, 2001; Robert and Gabbay, 1999; Sybase and Dynamic Healthcare Technologies, 2001):

- Cost Benefit Analysis and affordability

- Equipment considerations, which include disposability, expandability, sustained availability of parts, product options, training requirements, etc.
- Ergonomics
- Existing space with respect to the master facility plan of the hospital
- Impact on Functional Plan and/or Strategic Initiatives established by the hospital
- Infection control
- IT/IS infrastructure
- Potential for improvement in patient care and the prospective number of patients affected
- Potential for process re-engineering
- Potential to reduce health risks; an accompanying question is 'how prevalent is the condition potentially treatable by the technology under consideration?'
- Regulatory issues including legal information and standards
- Scalability, flexibility, and possibility for customization of the novel technology
- Security and safety
- Service contracts
- Speed and ease of deployment
- User friendliness of the technology

Each of these topics requires detailed investigation with regard to the impact of the implementation of the proposed healthcare technology. In the case of certain new technologies, for example data management systems, the maintenance of confidentiality must also remain a guiding principle of paramount importance. In the event that sufficient information of adequate quality is unavailable, the technology assessment cannot be conducted until such information becomes accessible. In addition to evaluating the aforementioned issues, it is also necessary to examine certain questions about the new technology (CCOHTA, 2001). Is it controversial? Is it a Class III device (based upon the FDA classification system) – i.e. one that sustains or supports life, is implantable, and/or presents possible risks of infection or injury (CDRH - U.S.A., 2002)? Does it impact an existing "gold standard" of treatment and/or practice? Also of prime importance is the existence of an available or emerging technology, which supplants the one under consideration.

2.2 *Systematic Process of HTA*

The process of assessing healthcare technology for the purposes of deciding whether or not to proceed with acquisition progresses sequentially from problem definition through data retrieval to formulation of conclusions and recommendations (see Figure 1 below). In the case that the acquisition decision supports adoption of the technology under consideration, then the subsequent HTA phase – acquisition and implementation (refer to Figure 2 on the next page) – is executed. Otherwise (i.e. in the event that there is a decision to abandon the given evaluated technology), the process concludes with the dissemination of conclusions and does not proceed to the purchase and installation sequence. While there is diversity in the scope and methods applied in the conduction of HTA, several fundamental steps comprise a universal protocol for the practice. The following two figures present schematics of the steps in the progression from start to finish. The ensuing text describes each of these basic levels in turn.

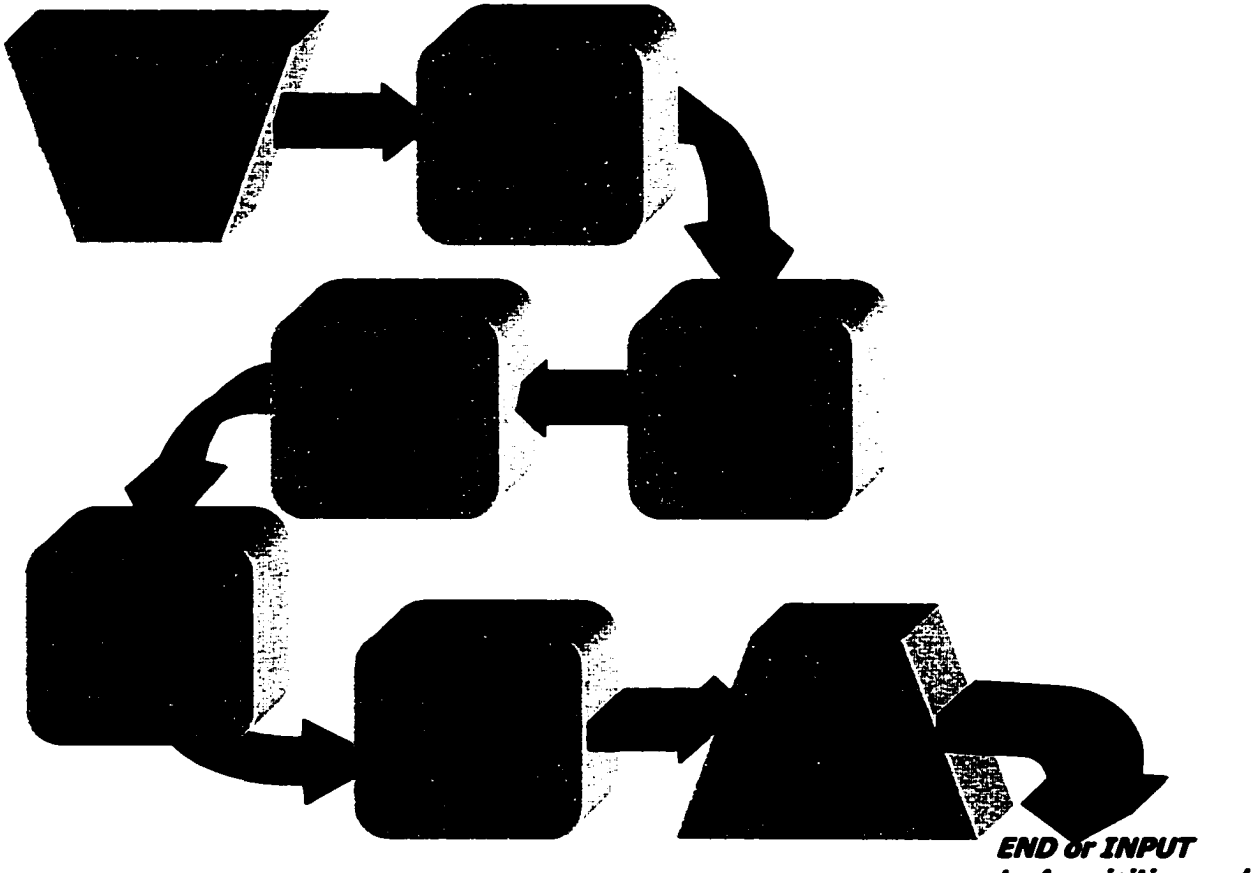


Figure 1. Steps in the Suitability Assessment Phase of HTA.

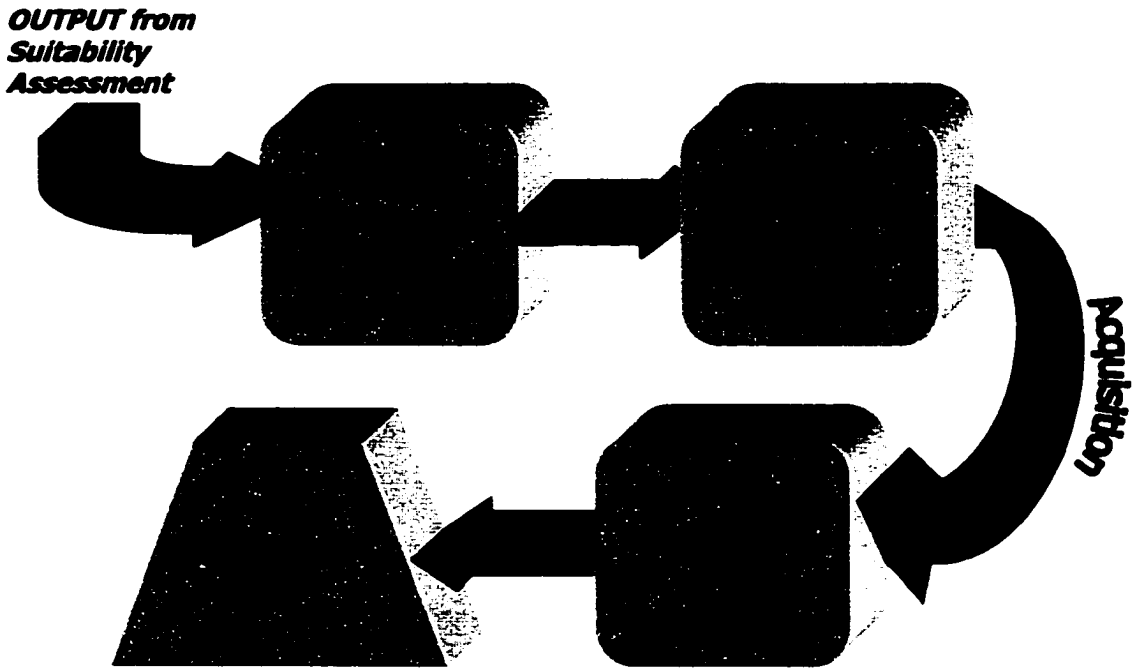


Figure 2. Steps in the Acquisition Assessment and Implementation Phase of HTA. In the event that there is a decision to acquire, the steps illustrated in this figure succeed those of Figure 1 on the previous page.

2.2.1 Evaluation of Suitability of Healthcare Technology

2.2.1.1 Specification of Assessment Parameters

This primary step involves the definition of the assessment, the determination of stakeholders, and the outlining of the scope and domain of analysis. It also serves to delineate the technology in question, its potential for process improvement, and its clinical application. The Visioning Exercise component of the process begins at this stage. A significant component of the HTA process involves the listing of problems, or rather, questions to be addressed by the process with regard to the impact of the technology under consideration. The specification of the appropriate unit of analysis – patient, clinician, hospital, etc., which is particular to the specific given technology under consideration – occurs. At this point, it is important to list the characteristics and/or composition of: patient population affected by the technology; aspects of healthcare

addressed by the technology; users of the technology; scope of the targeted implementation setting; the properties, impacts, and outcomes for evaluation.

2.2.1.2 Determination of Assessors

This stage marks the true beginning of the project management process. Project Sponsorship also factors in. A key accomplishment at this step of the HTA process is the determination of project responsibility and the creation of a Project Charter based upon Visioning Exercises (which may occur at both steps 1 [see 2.2.2.1] and 2). Comprehensive assessments require significant time commitment and adequate resources (including data resources, substantial and varied expertise, etc.). It is important to select the most appropriate individuals to conduct the process. Depending upon the nature of the assessment problem – both its scope as well as the technology at its foundation – different committees and representatives from diverse areas of the hospital will be most well suited to the execution of the task. Committees and subcommittees with varying representation (with the degree dependent upon the issue at hand) from strategic planning, capital planning, biomedical engineering, nursing, allied health, pharmacy and therapeutics, etc. may need to interact with one another in completing and reviewing the assessment (University HealthSystem Consortium, 1996).

In some instances, the hospital may opt to commission the work – in whole or in part – to specialist organizations devoted to HTA (NICHSR, 2001) (c.f. Appendix E – Resources). Sometimes hospitals outsource portions of an assessment project, such as data mining, and complete the other components in-house (NICHSR, 2001). Depending upon whether or not assessments related to the technology in question are available and accessible, there are different factors influencing decisions regarding "making" versus

"buying" (CDRH - U.S.A., 2002). If an assessment process pertinent to the technology selected for evaluation is already available, then the following questions arise:

- Is the information sufficiently recent or would it require updating?
- Does it exactly address the issues outlined for resolution by the current process?
- Is its perspective compatible to that of the hospital?
- Is the process adequately credible?
- Does its price reflect its value?
- Will the organization's own personnel accept results and recommendations if it has not at all participated in the process?

In the case that ready-made assessments pertinent to the given HTA are inaccessible, the following questions arise:

- Does the hospital organization have the human resources capability and time to perform the necessary research and analysis?
- Does the hospital have at its disposal the required financial resources to pay the potentially high costs of research, staff time, computer time, documentation purchases, etc.?

2.2.1.3 Data Mining

Literature searches and retrieval of associated data form an integral step in successfully completing the HTA (Goodman, 1993). The greater the extent of the research, the more comprehensive and credible the assessment: reviews of varied types of literature provide more evidence for analysis and also minimize publication bias and real and perceived conflicts of interest. The introduction (Chapter 1.0) notes the need for HTA to incorporate three discrete classes of knowledge: the scientific, contextual, and historical data types. To the first category belong raw technical and systematic data – traditional scientific research and literature, for example. Contextual evidence accounts for the frame (and accompanying terms) of reference pertinent to the given technology.

For example, certain Canadian provinces proposed the creation of incentives for attainment of preventative healthcare guideline targets (Battista and Hodge, 1999). Such parameters and other factors, which shape the introduction and implementation of novel technology, influence the milieu of policy decision-making. Historical data similarly address the circumstances of a given technology assessment setting, but refer more to individuals (in particular patients) rather than concepts. For instance, "patient preferences regarding pharmacologic or nonpharmacologic treatment of hypertension are likely to have a far more powerful effect on medication compliance than the relative efficacy of the medications the practitioner may consider" (Battista and Hodge, 1999). The gathering of patient and demographic-type data must factor into the information acquisition process.

2.2.1.3.1 Sources of Intelligence About New Technologies

The data mining process entails searches of numerous sources to locate applicable medical literature from around the globe. Often, technology assessment experts "must derive credible findings from numerous and sometimes contradictory studies of widely varying quality" (BCOHTA, 2001). While a review of the literature is an essential component of the research process, there are additional resources of import encompassing various means of information acquisition including telephone enquiries and case studies (Roberts and Gabbay, 1999). The following list details examples of possible HTA data sources:

- Experiences of other adopters of the technology – case studies and investigation of Beta-test research (Roberts and Gabbay, 1999)
- Technical, biomedical, pharmaceutical, and scientific journals, specialist ("containing early case reports, case series and uncontrolled studies") and principal

medical journals, and other publications; References provided in existing studies, reviews, analyses

- Databases on novel devices and pharmaceuticals; the global number of publicly accessible computer databases related to healthcare and biomedical literature is on the order of hundreds (NICHSR, 2001)
- Consultation with colleagues and experts by means of telephone and/or in-person interviews (Murphy et al., 1998; Robert and Gabbay, 1999)
- Biomedical, medical engineering, and pharmaceutical companies
- Government reports and monographs
- Industry press releases and annual reports
- Newsletters and newspapers devoted to the health sector
- Internet web sites – for example, those of HTA agencies at various levels (national, regional, etc.) (c.f Appendix E – Resources)
- Biomedical and clinical conferences, technology specialty meetings, and device expos
- "Fugitive" (or beyond traditional) literature sources: professional association reports and strategies, market research analyses, research institute studies, singular special panel and/or commission publications, conference proceedings, publications from "sentinel groups of expert health professionals", etc.; these sources potentially provide a wealth of data beyond their conventional counterparts, however, the former are often not subjects of peer review as are the latter (NICHSR, 2001).

For the most part, assessment processes involve the compilation of information from available sources, and do not entail the collection of primary data (which include clinical testing and epidemiological studies). However, as previously mentioned, HTA differs from conventional research in that it involves the generation of primary data when applicable. Oftentimes, it is easiest for the hospital to review primary data generated by device vendor-sponsored initiatives. In cases, which warrant and/or demand clinical

testing resources, the NIH, VA, and MEDLARS all provide clinical trials databases (NICHSR, 2001). Among other sources of primary data are: the Centers for Disease Control and Prevention's online CDC WONDER database, which details statistics such as mortality, incidence of disease, hospital discharges, etc.; NLM categorical registries; and the World Health Organization WHOSIS database of health statistics and epidemiology (NICHSR, 2001). Regardless of whether or not an assessment project contains primary data sources, it should make recommendations as to the types of primary studies required for the purposes of future assessment endeavours.

2.2.1.3.2 Cost-Benefit Analysis

Collection of data also includes cost-benefit analysis. While there are myriad methods of cost analysis, some of the main types include: cost-of-illness analysis, cost-minimization analysis, cost-utility analysis (CUA), cost-effectiveness analysis (CEA), and cost-benefit analysis (CBA) (NICHSR, 2001). Technologies cannot be cost-effective of their own accord; they must be deemed such by comparison with alternatives (NICHSR, 2001). Provided that the value of benefits and outcomes outweighs the cost of the technology, it is cost-beneficial (NICHSR, 2001). A limitation of CBA is its allocation of monetary values to all germane outcomes, which is not straightforward (e.g. in the correlation of costs with changes in the quality or duration of human life). CEA circumvents this drawback by means of attributing more direct units to outcomes (e.g. actual number of lives saved or cases of disease prevented); thus, this method has the capability to compare technologies with the same outcome units. In its assignment of utility estimates (including QALYs – quality-adjusted life years) to health outcomes, CUA is subjective like CBA; it also allows for comparison of technologies. The order of

usage of cost analysis methodologies, from most to least prevalent is as follows: CEA, CUA, CBA (NICHSR, 2001).

Cost avoidance as well as soft costs constitute important factors for inclusion in analysis. Other cost analysis considerations include: 1) perspective, 2) category and type of costs, and 3) time. Perspective [1] refers to the frame of reference for the technology assessment. Costs, benefits, etc. may be from the point of view of society, the healthcare practitioner, the patient, etc. For the most part, HTA conducted by a hospital will involve cost analysis from the standpoint of the hospital organization as a whole. Categories of cost [2] include: a) direct, which embraces equipment costs, hospital fees, practitioner fees, charges, etc.; b) indirect, which includes costs associated with patients' mortality and time lost from employment, etc.; and c) intangible, which addresses issues such as pain and anguish and is generally excluded from cost analyses. Marginal costs and average costs comprise types of costs [2]. The former deals with changes in outcomes correlated with different cost alternatives; this may assist in elucidating mechanisms of efficient resource usage. The latter takes into account the total costs and outcomes of a technology. One of the time-related [3] matters is timeframe and refers to the fact that the time period considered in the assessment greatly affects the results of cost and outcome analysis. For example, an option, which appears to be superior on the basis of one-year projections, may actually be less optimal than a competing option in the context of a five-year projection. The other time issues include such items as discounting and inflation; it is important to conduct present value calculations to account for these and other related effects.

2.2.1.4 Interpretation

Data classification, the execution of evidence ranking and scoring, and the selection of data for use in analysis mark the fourth stage of the first phase of HTA. The appraisal of the quality of gathered data is critical to the derivation of significant assessment conclusions. Systematic approaches to examining the validity and the methodological exactitude involved in generating the data, which have been collected, are a necessary component of any HTA process (Eddy, 1992). An element in the interpretation phase involves the listing and comparison of data attributes such as: randomization, blind studies, incorporation of controls, patient outcomes, and summary statistics across available data sets. This aids the process of determining the validity and quality of the mined data. The next step is to determine which of the available studies merit inclusion and to establish their relative importance in terms of power to influence the assessment process. For instance, the assessors may make the decision to place more emphasis on high quality studies relative to those of lower quality. The results of applicable and rigorous scientific studies should take precedence over expert opinion.

> In the absence of strong evidence, and where practical guidance is needed, expert group opinion can be used to infer or extrapolate from the limited available evidence. Where many assessment efforts are deficient is not making clear where the evidence fades and where the expert group opinion begins.
>
> (Institute of Medicine, 1985)

2.2.1.5 Data Synthesis

The next component in the assessment protocol is the consolidation and analysis of the data, which are both available and deemed acceptable. There are four basic steps at this stage. The first is the development of a model illustrating the decisions, choices, and/or options involved and their associated potential health outcomes. The next step is the use of available literature sources in the assignment of probabilities to each identified outcome. Subsequent to this is the evaluation of each outcome with regard to value

and/or attractiveness to reflect its usefulness and impact upon health-related quality of life. The final step involves the integration of the previous two stages. At this point, the assessors combine (usually by multiplication) the probability and value for each outcome to determine the expected value of each. This enables the determination of the most desirable option – i.e. that with the greatest expected value. Statistical analyses facilitate the consolidation of available and selected data. Ideally, sophisticated analysis affords the comparison of the functioning and attributes of the technology in question relative to other therapies and/or procedures for the same indication and/or application.

2.2.1.6 Drafting of Conclusions and Recommendations

This penultimate component of the suitability assessment entails decision-making regarding the safety and efficacy of the technology undergoing study. The formulation of conclusions requires a summary of the assessment process and description of findings and results. Various means of fulfilling the recommendations component of HTA include setting forth a series of options, detailing a practice guideline, or introducing a directive. An example of an assessment finding and associated recommendation is as follows: a novel technology is reasonably safe and effective, but certain patients are disinclined to a particular side effect; offer the choice of the new technology and the standard technology to patients and allow them to be part of the decision-making process with their clinicians.

2.2.1.7 Dissemination of Conclusions and Recommendations

It is of paramount importance that the findings of the assessment process be disclosed in an effective manner. If the process concludes without appropriately disseminating the findings of the HTA method, then the value of the practice is naught. According to the Association Director for Academic Practice and Professional

Development at the McGill University Health Centre, "patients are best cared for when their healthcare providers have access to the latest clinical knowledge" (Malo, 2001). Evidently, reporting of assessment findings and availability of these data to clinicians and other health care professionals is critical. This final stage in the process method requires sufficient planning and analysis. Since not much information exists on the subject of optimizing the dissemination process, unfortunately, it is often the case that "worthy HCTA messages get lost because of misidentified and misunderstood audiences, poor packaging, wrong transmission media, bad timing and other factors"(Goldberg et al., 1994). The fundamental strategy is to design the distribution effort to *affect the conduct of decision-makers*.

There are three dimensions of reporting HTA findings: definition of target group(s); selection of dissemination media; establishment of reporting strategy. Target groups include biomedical and clinical engineers and researchers, healthcare practitioners, hospitals quality control review boards, patients, educational institutions, healthcare technology vendors, and journalists (CDRH - U.S.A., 2002). Possible communication vehicles consist of the following: 1) electronic resources – the Internet, e-mail, online tutorials, radio, television; 2) printed materials – journals, mail, newsletters, newspapers; and 3) personal interaction methods – lectures and presentations. Communications plans may take any of the following formats: 1) institution-focused – accreditation, benchmarking, performance reviews, standards; 2) patient-focused – community-based promotions, interactive instruction materials, mass media promotions, modified insurance coverage; or 3) practitioner-focused – board certification, conferences and workshops, medical audits and/or peer reviews, performance data, professional

continued education, professional and specialty society membership. Any number of options may be selected in each category. The dissemination strategy arises based upon the identified target group or groups and the optimal means of information distribution.

2.2.2 Acquisition Assessment and Implementation of Healthcare Technology

Upon the completion of the seven steps involved in ascertaining the appropriateness of the given healthcare technology, the second stage components of HTA may or may not follow. The results of the suitability evaluation directly determine whether or not to proceed with technology acquisition. In the event that the hospital organization reaches the decision to obtain and employ the new technology under consideration, the following steps (schematically represented in Figure 2 on page 13) ensue.

2.2.2.1 Request for Proposal / Request for Quotation

> The importance of creating a solid and comprehensive RFP cannot be underestimated. If an organization takes the time and provides the resources to do it properly, an RFP sets the stage for a strong relationship with a potential vendor. Technology is volatile and constantly changing, and vendor relationships must be strong. The best way to ensure the dependability of the relationship is to understand the needs of the organization and effectively communicate them to a potential partner.
>
> Couris et al., 1999.

2.2.2.1.1 RFP/RFQ Development

This first step in the acquisition and implementation sequence is critical as "a correctly written RFP aids the development of a solid platform for technology purchase and implementation" (Couris et al., 1999). In addition, the RFP/RFQ process is important from a funding perspective. A comprehensive report, which highlights the technology's espousal of the hospital's core business, can assist the optimization of capital allocation for healthcare technologies.

The RFP/RFQ begins with a lucid presentation of the hospital's mission and vision statements, and business goals. It is crucial for the given objectives of the proposed technology to align themselves with the organization's mission, etc. The report then provides a context for the technology and identifies, evaluates, and documents the features desired by end users. It is at this stage that the organization must prioritize and clearly specify all of its requirements according to their levels of importance. Three different specification categories must be included: technical requirements, operational requirements, and business processes (Couris et al., 1999). "The operational requirement section of an RFP is undoubtedly the most important element of the proposal" (Couris et al., 1999). Couris et al. suggest the execution of an operational audit, which they claim can elucidate the organization's operations configuration, concurrently with the development of the RFP: "In most organizations, if an audit is done at all, it occurs after the technology has been acquired. It should instead be completed in concert with the RFP, so vendors can address the organization's operational specifics".

Highly detailed specifications are necessary. For example, a Radiology Information System RFP/RFQ may list specifications such as "allow alpha or numeric characters in medical record numbers" and "support user-defined mnemonic codes for exams to speed order entry" (On-Line Consultant for Healthcare, 2000). In the case of PACS technology, a sample requirement in an RFP is "provide sufficient web server capability to handle page requests and deliver 1024 x 1024 x 2 byte images to user's browser within four seconds on hospital network" (On-Line Consultant for Healthcare, 2000). The exact minimum functional system characteristics must be enumerated. If the

hospital requires the new technology to be compliant with HL7 (Health Level 7) integration standards, it needs to express this condition.

2.2.2.1.2 Proposal Evaluation

After the RFP has been developed, validated, and distributed to selected vendors, and then returned to the organization, the process of comparing and evaluating responses begins. Multiple bids provide the hospital with greater options for optimizing the balance between minimizing purchase costs and ensuring long-term technology viability. All responses must be systematically reviewed; their various features should be compared according to category. Technology considerations consist of factors such as standards, service, and support. Business practice issues include "willingness to partner, financial stability, and ability to provide or seek support for operational reengineering" (Couris et al., 1999). The review process should weigh each factor relative to the most important characteristic and then multiply each prospective vendor's scores by the appropriate weight. The decision-making process may involve the manipulation of tradeoff variables: "giving up areas of less importance in order to gain more in those areas of more importance" (Center for Health Policy, 1998). Overall scores are then graded to determine the top candidates. Upon determining this selected group, site visits to locations with these vendors' technology systems should be conducted.

In order to determine the optimal vendor candidates, it is important to consider the stability and long-term viability of the potential companies. Dr. Neil Johnson, Chief Medical Advisor, Clinical Informatics at the Children's Hospital Center in Cincinnati explains that changing vendors earlier than 15 years post implementation "is a prospect too horrible to contemplate" so prospective vendors must demonstrate "long-term vision

and commitment, substantial resources for development, and an aggressive approach to upgrades" (Rabinovitch, 2001).

2.2.2.2 Contract Development

Upon the selection of a vendor, the hospital may sign a letter of intent indicating its decision to proceed with dialogue. A stage involving rigorous negotiation follows. Again, attention to detail is of great importance. The organization must clearly specify all of its requirements and expectations regarding project deliverables, and associated equipment and supplies. In addition, the particulars of warranties and/or guarantees must also be established. Furthermore, this is the step for the drafting of service agreements and the assent on the parts of the hospital and the vendor. The organization's expectations regarding the vendor's training and support provision responsibilities are also set forth.

2.2.2.3 Installation

This point in the process of acquisition brings forth the transition between the procurement-readiness steps and the actual implementation. This stage involves the launch and distribution of the new technology. Associated equipment, supplies, and procedures are introduced. New technology orientation sessions and hands-on staff training occur. Any necessitated process redevelopment takes place. The implementation methodology may be either immediate or phased-in. According to Ontario Minister of Health, Tony Clement,

> Just when you think you have the answer, something new comes along... we favour an incremental approach, so we can be nimble if a new technology comes along. Then we can adapt. (Zeidenberg, 2001).

Modular approaches involving the phasing in of components over time may be favourable in cases, which are conducive to this type of implementation strategy.

2.2.2.4 Operation of New Technology

This final step marks the fully functional deployment of the new technology. This happens following the initial introductory phases (as described in the Installation step above). At this last point, the new processes and equipment associated with the new technology are actually realized within the hospital. The new technology is adopted and becomes a component of the organization's regular operations. It is at this stage that issues neglected earlier in the HTA process (in either or both phases [see Figures 1 and 2 on pages 12 and 13]) become apparent.

3. Methods

In order to achieve the goal of ascertaining and evaluating the current state of healthcare technology assessment and evaluation, a questionnaire was created. Its role was to serve as a tool for surveying HTA processes in Canadian hospitals. The questionnaire was entirely confidential and sought insight regarding experience with new and emerging diagnostic and treatment capabilities.

3.1 Determination of Recipients

The search for available Canadian hospital mailing address lists in electronic format proved to be challenging. At the time when the research was conducted, no such resources were available on the Internet. Certain provincial websites (both of a general and hospital association nature) contained information about hospitals and their location, but not in a format, which was necessarily complete or conducive to uncomplicated rendering to an electronic mailing list. The discovery of the comprehensive bound volume entitled *3rd Annual Canadian Health Facilities Directory* (copyright 2001) prompted the investigation of the availability of the electronic version of the data contained therein. After several unsuccessful attempts to contact representatives of the company purportedly (according to an enclosure in the Directory) responsible for the maintenance of the health facility data and an associated electronic database, the decision was made to manually transfer the hard copy data into a database.

A table Mailing List was created in a database file entitled Canadian Hospitals.mdb using Microsoft Access 2000 Version 9.0 software. Mailing List contained the following sixteen fields: MailingListID, Prefix, FirstName, LastName, Title, Hospital, Address, City, Province, PostalCode, Notes, beds, e-mail, e-mail ID,

NAME ID, French. The first field was an auto-numbered primary key for the table. The second through fifth fields were associated with contact information for individuals, while the sixth through tenth items pertained to hospital mailing address information. The remaining fields were administrative in nature and provided information for future data manipulation and analysis.

Pertinent data from the *Health Facilities Directory* were collected and manually inputted to populate the Mailing List table. The preliminary creation of input forms linked to the table facilitated the otherwise tedious process of data entry. The amount and type of information available varied across the hospitals. In cases where e-mail addresses were listed in association with particular hospitals, these were included in the corresponding database records. Similarly, in instances in which contact information was present for specific hospitals, these data were input into the records for these hospitals in the database table. The 'French' field in the records for hospitals located in the provinces of New Brunswick and Quebec (and also for a small number of hospitals in other provinces that had French and English names) was flagged to indicate that bilingual questionnaires were to be sent to them. Records were created for each individual hospital for which a profile existed in the hospitals section of the *Health Facilities Directory*, with the exception of facilities identified as "Nursing Stations" or having less than fifty beds. In total, six hundred and nine records were created.

3.2 Creation of the Questionnaire

As a basis for familiarization with the important aspects and terms of healthcare technology and assessment, various sources were consulted. Important concepts were gleaned from literature searches, request for proposal (RFP) reviews, and a visit to a

device expo at a local community hospital. Nevertheless, the synthesis of the questionnaire was entirely original and not based upon any existing designs with regard to both content and layout. Background information was obtained from perusals of journals such as ECRI (formerly the Emergency Care Research Institute) and of RFP's for wireless phone and cardiac data management systems. In addition, attendance of a point-of-care device exhibition highlighted principal characteristics, which are the focus of healthcare technology and marketing.

The survey composition attempted to be comprehensive with a view toward maximizing the collection of constructive information, yet concise and straightforward so as to invite response efforts. Questions requesting narrative and descriptive answers were balanced with undemanding check box type items. In regard to this latter category of multiple-choice questions, there were two types of queries. Respondents were asked to place a check mark or shade appropriate circles or boxes to either select 'yes' or 'no' in one type, or to indicate levels always on a scale of one to four (where one is lowest and four is highest) for the other group of questions. In the case of the second type, the one through four scale was deliberately selected so as to prevent respondents from selecting an evenly intermediate response. (For instance, had a one to five scale been utilized, the selection of the number three would have enabled a perfectly central position without any leaning to either the low or high ends). Precise middle responses are ambiguous and difficult to integrate in analysis. Another key component in the content of the questionnaire was the separation of overall technology assessment and equipment evaluation. As there is a potential for confusion of the two, the document differentiated between them. Medical technology includes all things related to the application of

engineering science techniques to health care problems; technology includes equipment, but is not limited to it. In this thesis study, not all questionnaire respondents indicated comprehension of this distinction.

The questionnaire passed through several iterations prior to finalization and preparation for dissemination. In the final draft, the questionnaire was shortened (by means of more concise posing of questions) so that six letter-sized pages could accommodate it, while maintaining an adequately sized font and including relevant content. For the purposes of electronic distribution, the survey was also translated into a Visual Basic (VB) forms-based document in Microsoft Word 2000 Version 9.0. This document was password-protected to constrain users to respond according to directions and to prevent them from modifying any of the associated text and/or instructions. Instructions were in blue colour and areas requiring user input were shaded grey. The online form was beta-tested by five different users to ensure the accuracy of the VB coding and the sufficiency of the accompanying instructions. The electronic adaptation was identical to the hard copy version in terms of content and format and/or layout appearance. The difference was that the former could be completed by means of using a computer, while the other required pen or pencil. See Figure 3 on the subsequent page for a depiction of the appearance of the electronic version. Both the electronic and paper form surveys were translated into the French language by the author.

The questionnaire commenced with questions regarding the hospital size (number of beds) and type (teaching or community). It subsequently inquired as to the organization's recent (specified to be within the past five years) acquisition of new and emerging patient care technology and equipment and asked for an answer in the form of

"yes", "no", or "not yet". It asked the respondent to submit the survey uncompleted (from that point forward) in the event that the answer is "no", and in the case of the first and last options, required the respondent to continue to complete the questionnaire and

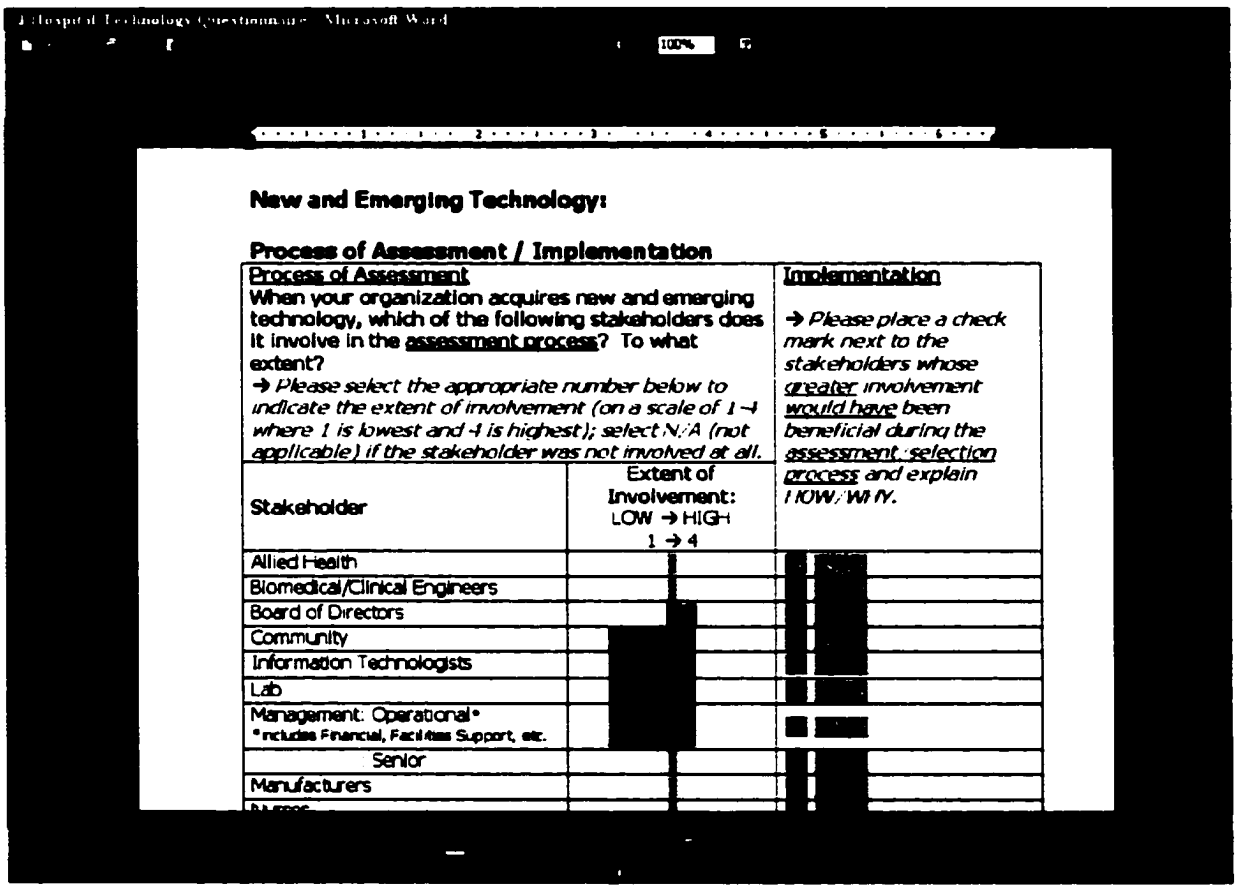


Figure 3. Example of the onscreen view of the electronic version of the questionnaire in Microsoft Word. Note the drop-down menus for the completion of the one-four scale questions, the blue colour of the instructional text, and the grey shading of the fields requiring input.

then return it. The next section asked general questions regarding the new technology including time of, and reasons for, acquisition.

The remainder of the document consisted of these two sections: processes of assessment and implementation, and measurement of success. To the first section belonged the subsections "Process of Assessment", "Equipment Considerations", and "Implementation of New and Emerging Technology". The first subsection addressed

issues of stakeholder involvement as well as factors impacting the evaluation process. The following subsection referred to equipment-related considerations involved in the assessment process. Finally, the third part asked for information regarding details surrounding the selected technology and about unforeseen circumstances encountered. Next, in the "New and Emerging Technology - Measurement of Success" segment, the effects and outcomes of the technology implementation were examined. The survey concluded with questions, which asked the respondent to consider his/her hospital's new technology assessment and implementation processes and potential means of improvement. (Refer to Appendix D for the English [D.1.1] and French [D.1.2] versions of the questionnaire).

3.3 Design of Cover Letters

A cover letter was developed to explain the purpose and breadth of the questionnaire. While there were different versions of the letter to attend to the various circumstances dictated by the information present in the Mailing List table, each of these documents constituted a variation upon a theme. As the name of the president and/or CEO was not known for each hospital, a modification had to be made to the original cover letter, which directly addressed this individual. In all cases, letters informed recipients of the research goals and explained the importance of the study and the targeted addressees: the statement was made that the aspiration was to obtain responses from as many Canadian hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, Director of Clinical/Biomedical Engineering, etc. – as possible. For each of the versions (in both conventional and electronic mail formats) detailed in the following sections (3.3.1 and

3.3.2), there are equivalents in the French language. Refer to Appendix D.2 for the English and French versions of all of this correspondence. Using the 'Mail Merge' utility in Microsoft Word 2000 Version 9.0, the Mailing List table records were utilized to address hospital-specific cover letters to all of the facilities contained in the database. This same table served as the source of data for the generation of mailing labels.

3.3.1 Conventional Mail

There were three different letters associated with the questionnaires disseminated by conventional mail: two of the main variety sent to the attention of the President/CEO (in the first case to said individual by name, in the second case to "Sir or Madam" since the contact information was absent), and a third sent to unspecified other members of the hospital organization. In the case of available CEO contact information, the letter asked the individual to complete the questionnaire him- or her- self and to distribute the other two enclosed copies to other members of the hospital (of his or her choosing). In the case of unknown CEO contact information, the letter requested the recipient (hopefully the CEO) to complete the questionnaire if he/she constituted an appropriate respondent, and again to distribute the other two copies of the questionnaire to other members of the organization (or, if he/she was not the CEO or similar administrator, to distribute all three copies accordingly). The third variation upon the standard cover letter was the document, which was to be distributed to the two (or three) other unspecified members of the given hospital. All versions of the letter explained an option for recipients to request an electronic version of the questionnaire instead of the hard copy edition they had received. The author individually signed all copies of the letters addressed to (known or unknown) Presidents/CEOs. This was not the case for the letters destined for unspecified members

of the hospital organization; these were signed with the author's initials using a single version of an inserted digital graphic (generated by a flatbed scanner image of these handwritten initials).

3.3.2 Electronic Mail

There were two different letters associated with the questionnaires disseminated by electronic mail: one sent to the attention of the President/CEO (for cases in which this contact information was available in the Mailing List database table), and the other addressed to the generic "Sir or Madam". The former invited the addressee to complete the survey him- or her- self and to forward the message to others as he/she saw fit. The second category of letter requested the recipient to forward the message to the appropriate individuals within the organization. In both instances, the letter explained an option for recipients to request a paper version of the questionnaire instead of the electronic adaptation they had received.

3.4 Dissemination of Survey Requests

Electronic mail was the preferred means of survey distribution as this method is more rapid and more cost effective than the conventional mailing mode. For all hospital records in the Mailing List table for which e-mail addresses are known, questionnaires were sent by electronic mail.

3.4.1 Conventional Mail

Surveys sent by conventional mail required the assembly of individual packages for each hospital designated as such a mail recipient. In some cases, both French and English surveys and cover letters were included in the parcels (c.f. §3.1 Determination of Recipients above for further detail regarding bilingual questionnaire recipients). Three

copies of the survey plus three self-addressed postage-prepaid envelopes were included in each package. The hospital name was printed on the front page of each survey. This measure was taken to enable the inputting of received response data to correspond with appropriate hospital records in the database. While the study results are entirely anonymous and confidential (no hospitals are identified in the reporting of data analysis and results), the incoming data were not anonymous from the perspective of the database architecture.

3.4.2 Electronic Mail

Microsoft Outlook 2000 Version 9.0 was used to disseminate questionnaires by means of electronic mail. The sender account for these e-mails was n.dudar@utoronto.ca. In some cases, both French and English surveys and cover letters were included as attachments in the e-mail messages (c.f. §3.1 Determination of Recipients above for further detail regarding bilingual questionnaire recipients). The subject line utilized in the messages was "Technology Assessment in Canadian Hospitals" or "Évaluation de technologie dans les hôpitaux canadiens / Technology Assessment in Canadian Hospitals".

3.4.3 Summary: Survey Distribution

A total of six hundred and nine (609) (the number of hospital records in the Mailing List table of the CanadianHospitals.mdb database) survey request dissemination attempts were made. To the best of the author's knowledge, in total, five hundred and seventy-six (576) survey requests (166 electronically and 410 by conventional mail) were distributed successfully. Of these, 26% (151/576) were bilingual. As previously noted (as per details in §3.4.1 above), the conventional mail packages each contained three

copies of the questionnaire, thus the total number of blank surveys disseminated was 1,396 (166 electronic versions + 3*410 conventional versions).

A total of thirty-three (33) survey requests were returned without being delivered to the intended recipients. Of these, six (6) were attempted to be sent by the conventional mail method and the remainder (twenty-seven [27]) were electronically mailed. It was surprising to note that the *3rd Annual Canadian Health Facilities Directory* (copyright 2001) had provided faulty mailing address information for certain hospitals and that in one case the 'return to sender' notation on the returned questionnaire package indicated that there had been no such address "for 5 ½ years now". In the case of electronically distributed questionnaires, there was originally a greater number of unsuccessful send attempts (i.e. returned messages), however, these were remedied by means of additional research (in the form of hospital website searches and telephone calls placed to hospitals) to correct the e-mail addresses.

	TOTAL SUCCESSFUL SURVEY REQUESTS				Total Distribution Attempts			Unsuccessful Distributions		
	TOTAL	ENGLISH	BILINGUAL		English	Bilingual	Total	English	Bilingual	Total
Conventional Mail	410	290	120	71%	295	121	416	5	1	6
Electronic Mail	166	135	31	29%	144	49	193	9	18	27
				100%	439	170	609	14	19	33
	100%	73.8%	26.2%							

Table 1. Summary: Questionnaire Dissemination Events. See Appendix D.3 Table D1 for more detailed information regarding the composition of the identified groups.

3.4.4 Follow-up Survey Distribution

As the cover letters invited survey recipients to request alternative formats (i.e. soft copies of the questionnaire in the event that they had received hard copies and vice versa), some respondents did so. Thus electronic versions were sent to three individuals requesting these in place of the hard copies, which they had received via conventional

mail. Similarly, two individuals requested paper versions of the questionnaire instead of the electronic files, which they had received as e-mail attachments.

3.5 Design and Construction of Responses Database

An additional table entitled Responses was created and added to the database file, Canadian Hospitals.mdb in Microsoft Access 2000 Version 9.0. This table contained one hundred and seventy-nine fields. (For the purposes of concision, these will not be detailed here). Each of these fields (with the exception of the primary key [MailingListID] and the field that stored hospital names [Hospital], which were both linked directly to the fields having the same names in the Mailing List table previously described [c.f. §3.1]) corresponded to a single item in the questionnaire. For the purposes of simplifying data input, thereby increasing efficiency and decreasing error, forms were

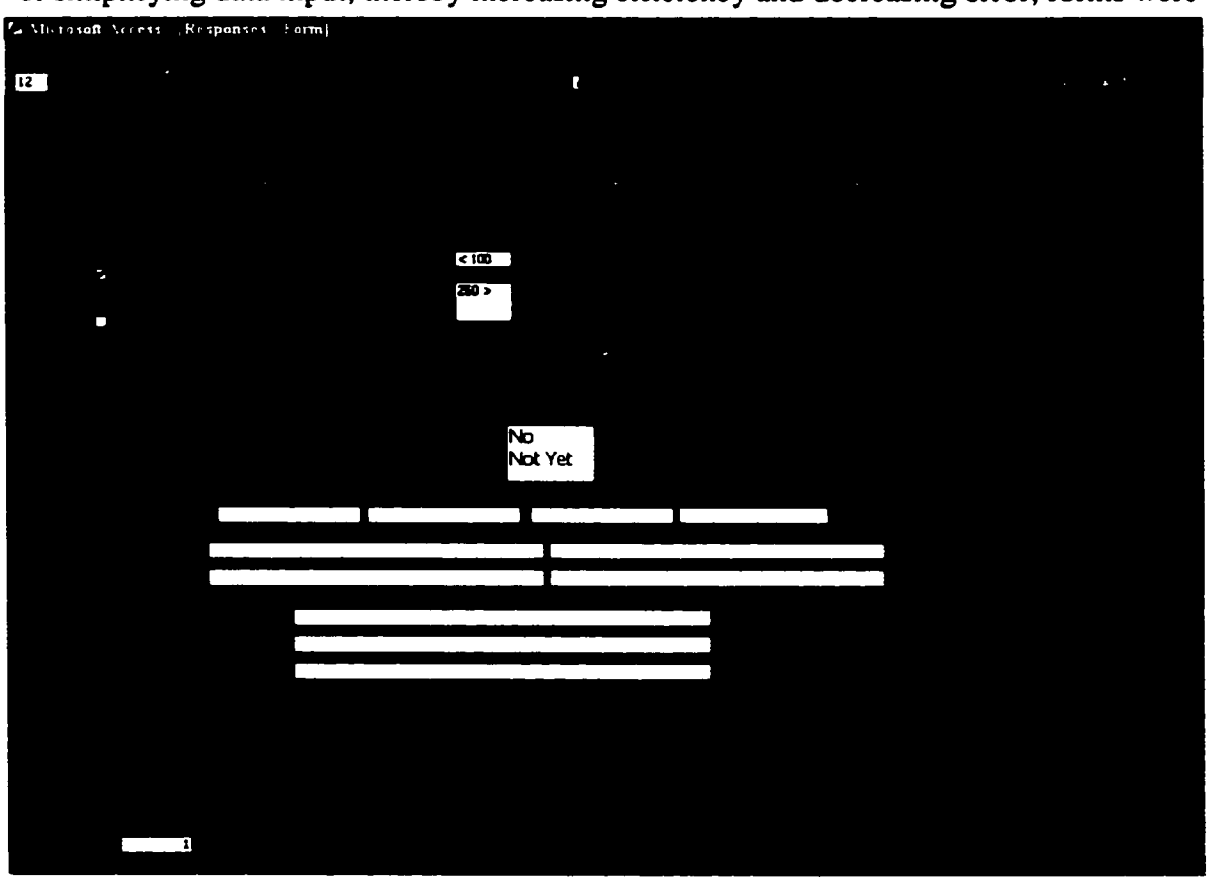


Figure 4. An example of the onscreen view of one of the input forms designed in Microsoft Access. Examples of selected options are included. The hospital name field has been cleared for the purposes of confidentiality.

designed in Microsoft Access and linked to the fields in the Responses table. Thus, information gathered from each of the surveys was manually inputted in online forms, which automatically directed these data to the appropriate records and fields in the tabular responses datasheet. See Figure 4 on the previous page for an example of the appearance of an input form.

3.5.1 Search for Indicator Data

In order to evaluate the clinical activity of the group of hospitals comprising the response data set relative to the remaining hospitals in the nation, the concept of indicator data arose. It was believed that a measure of any combination of: number of births, surgical patient days, emergency department visits, ICU days, etc. would provide an indicator for comparison. Even if a limited number of hospital responses were received, it might be the case that the indicator could demonstrate that these replies represented a significant percentage of the annual Canadian hospital activity (e.g. in the form of total surgical patient days or some other variable).

Exhaustive Internet searches for indicator type data were conducted to no avail. Telephone calls placed to the Canadian Healthcare Association (CHA) and the Canadian Institute for Health Information (CIHI) revealed that only the latter maintained the type of information that was sought. CIHI possessed a District Access Database (DAD), which contained fields regarding length of stay, number of surgical operations, etc. However, privacy and confidentiality restrictions forbade the release of data identifying specific facilities. An exception could be made in the event that each individual hospital (of interest in this study – i.e. those which provided questionnaire responses) provided written permission requesting CIHI to release hospital-specific data to the author for the

purposes of the research project. The task of gathering such letters of permission from each hospital was prohibitive. Furthermore, the Graduate Student Data Access Program (GSDAP), through which this data request process would have been executed, was limited to three request intake days per year and these were such that they did not accommodate the timeframe of this research project.

In the quest for other possible options, another perusal of the *3rd Annual Canadian Health Facilities Directory* (copyright 2001) was undertaken. This directory provided the following data on a facility basis: admissions per year, day surgeries per year, clinic visits per year, day care visits per year, diagnostic lab visits per year, average length of stay (in days), and average daily admissions. Unfortunately, however, all of these subjects were not listed for every hospital; rather, varying combinations were present for different facilities, and in some cases no such data were presented. Thus, there was no constant comparator provided in the *Health Facilities Directory* for all of the hospitals involved in this research study. If such an indicator had been present, this could have been manually entered in an added field for each facility record in the linked Mailing List and Responses tables. As both of the essayed methods (that is the CIHI DAD request route and the *Health Facilities Directory*) proved futile, it was determined that there would be no comparative indicator employed in this study.

3.6 Compilation and Analysis of Data

3.6.1 Hospital Identification

In a limited number of cases, the identity of the hospital referenced in the submitted questionnaire was not apparent. In the case of conventional mail surveys (which contain the name of the hospital on the first page), there were three responses, for

which the hospital identity was not readily determined, as it was discovered that there are multiple hospitals in various locations bearing identical names. The postage marks on the survey return envelopes provided no indication as to the originating city, or even province. In these cases, Internet-based research to determine bed number and hospital type (teaching or community) for each of the candidate facilities revealed the only possible hospital. This was achieved by means of the process of elimination, which relied upon a comparison of the data provided in the completed surveys with those obtained from the Internet search. With regard to electronic versions of the questionnaire, there was only one instance of unknown hospital identity. An electronic version of the survey was received from an individual to whom the original request had not been directly sent. Thus it was not evident with which hospital this individual was associated. Since the respondent provided his name and telephone number in the text of the e-mail message, it was possible to determine the hospital identity on the basis of the telephone number (using Internet Reverse Look-up and Area Decoder websites).

3.6.2 Categories for Data Analysis

For the purposes of analysis in this document, the responses to the questionnaire were organized in three different ways. These main categories are type of technology, type of facility, and position of respondent. The first classification constituted the primary means of analysis. The latter two served as secondary comparators. The tables on the following page depict the composition of these classifications.

Type of Technology	
PACS	PACS (Picture Archiving and Communications System) and RIS (Radiology Information System)
HIGH	High-end technology and associated equipment (including CT, MRI, linear accelerators, robotics for molecular genetics, etc.). There are high costs associated with this technology; a focused assessment and broader support are required.
DIRECT	Technology and associated equipment, which are involved in direct patient care and are in direct contact with patients but are not in the MONITOR category (see below). e.g. phosphoresis lasers, infusion pumps, surgical lasers, defibrillators
MONITOR	Technology and associated equipment involved in monitoring patient status (e.g. cardiac monitors, anesthesia machines)
HIS	Hospital Information Systems, e.g. Meditech, financial systems, etc.
OTHER	Low-end and miscellaneous technology and associated equipment (including card lock systems, ceiling lifts, patient wandering monitoring systems, dictation systems, nurse call systems)

Table 2. Classification Specifications for Technology Type Category. For a detailed listing and classification of all of the different technology and equipment types reported in the questionnaires, refer to Appendix B – Analysis Categories; §B.1 Type of Technology.

Type of Facility	
CANCER CENTRE	cancer centers
COMMUNITY	community hospitals
Chronic Care/Long-Term Care (CC/LTC)	chronic care hospitals, long-term care facilities, continuing care centres, long term residential facilities, nursing homes
Psychiatric/Rehabilitation (PSY/REHAB)	rehabilitation hospitals, regional psychiatric facilities, rehabilitation centres for the mentally challenged, centres for the developmentally disabled
REGIONAL	regional board, regional hospital, regional health authority, provincial office
TEACHING	teaching hospitals
UNSPECIFIED	no information provided

Table 3. Classification Specifications for Facility Type Category

Position of Respondent	
BIOMED	Biomedical and Clinical Engineering positions
IT/IS	Information and Computer Technology positions
MATERIALS	Purchasing and Materials positions
MANAGERS/DIRECTORS	Managers, Directors of various departments, Vice Presidents of specific departments
SENIOR	Executives, Upper Management

Table 4. Classification Specifications for Respondent's Position Categories. For a detailed listing and classification encompassing all of the different positions reported in the questionnaires, refer to Appendix B – Analysis Categories; §B.2 Position of Respondent.

In the case of Facility Type based investigation, only two groups were compared: Community and Teaching hospitals. The other types (Long-Term Care, Rehabilitation, etc.) were omitted as there were insufficient data associated with these individual groups. This resulted from the fact that few (in these groups) answered "Yes" to the recent technology acquisition question and proceeded to complete the survey. However, the data associated with these different facility types were represented in the other classification-based analyses (technology type and respondent position) as none of the three categorizations were mutually exclusive.

3.6.3 Aggregation and Analysis of Data

Data accompanying surveys in which the answer to the recent technology acquisition question was "Yes" (and in some cases – where desired data for analysis in a particular section were available – "Not Yet") were analyzed. For unforeseen circumstances investigation, absolute number and percentages of responses ('Yes', 'No', and no response) were tabulated. In the cases of other sections of the questionnaire, rather than reporting absolute numbers of responses meeting specific criteria, percentages were calculated to provide response profiles. For a given topic of analysis, data were examined on the basis of the proportions of survey responses in each of the levels (pertaining to level of importance, or extent of involvement, or level of agreement) in the 1-4 scale. With regard to the categories for data analysis (see 3.6.2 above), the majority of instances involving evaluation of data by category occurred for Technology Type. Position of Respondent analysis is included in §4.9 Evaluation of Success of Implementation. Facility Type and Position of Respondent analyses were carried out for

the purposes of inclusion in Appendix C – Survey Response Details and Data Analysis Data Tables.

It was recognized that in some instances there were small numbers of responses in some categories. These data do not purport to be generalizeable, but it is believed that they do give some indication as to the nature of responses particular to that category. In cases where there is a level of comfort with the statistical significance of the number of responses in a particular category, percentages and/or absolute numbers will be reported. Otherwise (i.e. in instances where the sense is that the size of the response set is simply too small) general comments (as opposed to numerical data) will be provided.

4. Results

4.1 Responses

4.1.1 Number of Responses Received

One hundred and twelve responses were received with regard to the questionnaire. Thus, there were 112 records in the Responses table in the database. However, this number of responses corresponded to one hundred and two (102) unique facilities. There were ten hospitals for which more than one response was submitted. In these ten cases, two completed surveys were received for each facility. All of these duplicates arose from conventional mail requests. (Refer to Appendix C.2 Individual Facilities Represented for additional information regarding these duplicate replies).

The one hundred and two individual facility responses constituted an overall response rate of 17.7 per cent – 19.8% for conventional mail and (surprisingly less) 12.7% for electronic mail. A total of ninety-one (91) responses (representing 81 unique facilities) were received by conventional mail and twenty-one (21) responses were received by electronic mail. (Refer to Appendix C.2.3 Response Rate for further analysis of questionnaire response rates). It is important to note that all response rate calculations were based upon the worst possible case, and as such represent absolute minima. As stated in §3.4.3 Summary: Survey Distribution, to the best of the author's knowledge, a total of five hundred and seventy-six survey requests were distributed successfully. The response rate calculations assumed this maximal successful distribution; in actuality, the number of requests successfully transmitted and received by intended recipients may have been less, which would correspond with higher rates of response.

4.1.2 Nature of Responses

The questionnaire posed a question as to whether or not the hospital organization had purchased any new patient care equipment that could be considered new and emerging technology. Approximately half of the responses received indicated a positive answer to this question (47.3% "Yes" and 2.7% "Not Yet"). See Table 5 below. Appendix C.1 Nature of Respondents' Replies to the Inquiry Regarding the Acquisition of New Technology contains further detail regarding the composition of responses according to various categorizations. In some instances, the submitted responses provided no answer to this question; these cases are identified as "no response" in Table 5. The respondents associated with these facilities claimed that their facilities were not applicable to the study or that they had no beds. The majority of such non-responses occurred in the case of Chronic Care and/or Long-Term Care facilities. Associated comments included these example statements: "As we are a continuing care facility, technology assessment is not part of the care that we provide and it would be inappropriate for us to respond", "We do not need high-tech equipment on site. We care for the aged and use the nearest hospital's facilities for medical care needing such equipment", and "we believe we are not appropriate for the study as we are not a hospital and have no new technology".

Response	Number of Responses	Percentage of Total Responses
Yes	53	47.3%
No	35	31.3%
Not Yet	3	2.7%
no response	21	18.8%

Table 5. Summary: Questionnaire Responses to the question regarding the acquisition of new/emerging technology within the past five years.

In terms of absolute number of responses, community hospitals had more 'Yes' replies (thirty) than teaching hospitals (which had twenty) – see Appendix C.1.2, Table C2. However, a greater proportion – 87% (20 of 23) – of the teaching hospital response set was comprised of 'Yes' answers. The percentage of such replies associated with community hospitals was 67% (30 of 45). With regard to facility size (given by bed number), the greatest quantity of 'Yes' responses (both in terms of absolute number and percentage) was obtained from hospitals with greater than two hundred and fifty beds – see Appendix C.1.3, Table C3. With the exception of the Yukon Territory, all provinces were represented among the respondents who claim to have purchased, within the past five years, new patient care equipment that could be considered new and emerging technology. Refer to Appendix C.1.4.

4.1.3 Timeframe

Questionnaire respondents revealed information regarding health technology assessment, acquisition, and implementation processes spanning the period 1997-2003. Three respondents specified that the timeframe for these processes was "ongoing" or "continuous". The majority of responses referred to the year 2001. (c.f. Appendix C.3).

4.1.4 Position of Respondent

Of all of the respondent position categories, individuals in the Managers/Directors and Biomedical/Clinical Engineering groups contributed the greatest number of responses. The group, which made the smallest contribution to the survey data set is Information Technology/Information Systems.

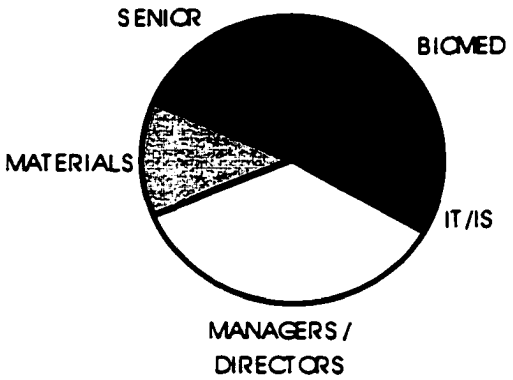


Figure 5. Composition of Respondent Group by Position Type

Position	
BIOMED	27.8%
IT/IS	5.6%
MANAGERS/DIRECTORS	35.2%
MATERIALS	13.0%
SENIOR	18.5%
	100.0%

Table 6. Composition of Respondent Group by Position Type

4.1.5 Type of Technology by Type of Facility

The following table details the relative quantities of the different types of technology discussed in the questionnaires submitted by community and teaching hospitals.

Type of Technology	Type of Facility	
	COMMUNITY	TEACHING
PACS	13.7%	16.0%
HIGH	21.6%	36.0%
DIRECT	17.6%	16.0%
MONITOR	17.6%	12.0%
HIS	23.5%	12.0%
OTHER	5.9%	8.0%
	100%	100%

Table 7. Technology Type Profiles (percentage of responses per technology type category) for Community and Teaching hospitals

4.2 Driving Factors and the Value of New Technology

The questionnaire responses provided insight into hospitals' motivation for assessing and acquiring new and emerging technology. Chief reasons sited included Y2K issues, aging and/or obsolescence of equipment and parts, and the potential to improve patient care. Independent of the type of technology involved, respondents

consistently commented on the drive to enhance patient care: improved patient outcomes, decreased waiting times, more rapid recovery, reduced anesthesia, better diagnoses, etc. In addition, a number of respondents indicated that the impetus for the adoption of new technology was the desire to define areas of clinical excellence, to achieve leadership status in specific fields, or to simply become a leader in "the application of new technologies" or to "position the hospital as an area hospital of choice by providing state-of-the-art information management tools". In some instances, the forthcoming merger of facilities and/or the development of new hospitals provided the incentive to "build for the future and not employ older technology". Other reasons included interest and/or demand for new technology expressed on the part of physicians and/or patients. Survey respondents also perceived new technology to be capable of improving quality, accuracy and efficiency of processes (both clinical and administrative); providing more options and functionality; and reducing waste (e.g. chemicals, film, storage space). See Appendix A.1 Driving Factors Contributing to the Acquisition of New Technology for a complete list of reasons cited in questionnaire responses.

Survey respondents indicated a variety of positive effects associated with the deployment of new and emerging technology. Table A2 in Appendix A.2 The Value of New Technology provides an overview of the types of responses elicited by the inquiry into the impact of emerging technology. (The specific question posed in the questionnaire was "Do you notice a difference in patient care pre- versus post-incorporation of new and emerging technologies in your particular hospital environment? What is the greatest contribution these technologies have made?"). In some cases respondents simply answered "yes" without further elaboration; since these one-word

responses are not included in the table, the quantity of comments for each category should not be considered to be indicative of the level of impact produced by each type of technology. Among the contributions outlined were the following: earlier and superior diagnosis and detection of pathology; earlier treatment; increases in speed, accuracy, and quality; decreases in OR time, in length of stay and in incidence of errors. Overall, replies conveyed the view that the acquisition and utilization of new and emerging technology led to increased quality in delivered care and improved patient and staff safety.

4.3 Stakeholder Involvement

The adequate involvement of individuals who have an interest or a level of expertise in given technology assessments is critical. Stakeholders should be consulted and called upon to contribute throughout the duration of the process. The questionnaire undertook to determine and compare the extent of participation of various stakeholders. The survey identified the following as stakeholders and asked respondents to rate the involvement of each: Allied Health, Biomedical/Clinical Engineers, Board of Directors, Community, Information Technologists, Lab, Operational Management (which includes Financial, Facilities Support, etc.), Senior Management, Manufacturers, Nurses, Patients, Physicians, Support Services, Technology Officers (Equipment Users). The survey also required respondents to specify any other individuals, whom they considered to be stakeholders in technology assessment. The following list depicts the composition of the "other" such individuals detailed in the collection of completed questionnaires: Regional Staff, Public Works Consultants and Projects, Purchasing, Physicists, Other Organizations Involved in Implementation, Foundation, Material Management.

The involvement of interested parties with interest and expertise is critical to the success of the processes of HTA and of the subsequent implementation. One questionnaire response included the following comment: "I feel our process went very well and there is nothing we needed to change". This is a rare sentiment, as most replies indicated areas of possible modification or adjustment in process structure. It is of note that this single respondent who reported this satisfied outlook was also unique in another manner: this individual indicated a "high" (4 on the 1-4 scale) level of involvement for over fifty percent of the stakeholders listed in the questionnaire, and to the remainder attributed "middle-high" (3 on the 1-4 scale) extent of participation. Furthermore, this same individual reported only one unforeseen circumstance (and this was with regard to renovations: "A couple of minor changes were required after all other renovations had been planned for"). As will be detailed subsequently (in §4.6 Unforeseen Circumstances), it is rare for there to be few unexpected circumstances. An elevated extent of stakeholder participation is correlated with a high degree of success in the HTA.

4.3.1 Overall Extent of Involvement

Based upon all of the tabulated responses, it is evident that the extent of stakeholder involvement was not consistent across the entire body of stakeholders. While some enjoyed a high degree of participation, others were minimally involved in the process. Furthermore, the two types of management (operational and senior) were the only participants whose involvement was never deemed inapplicable by survey respondents (see Figure 6 and Table 8 on pages 53 and 55 respectively). In the cases of five different stakeholders – namely Lab, Allied Health, Board of Directors, Patients, and

Community – the overall response set attributed to them less than fifty percent of middle-high and high extent of involvement responses.

Biomedical/Clinical engineers received the greatest proportion (65.4%) of high extent responses relative to all of the responses for that stakeholder type. This high proportion of high extent responses was nearly reached by two other types: senior and operational management (where the proportions of their high degree of participation responses were 58.0 and 54.0 percent respectively). In fact, Operational Management had the highest ratio of middle-high plus high extent in its response profile: 88.0% of the responses for this stakeholder were of the middle-high or high level of involvement. Three stakeholders comprised the group of second greatest proportion of high extent responses: Physicians, Technology Officers (Equipment Users), and Manufacturers; the percentage of their high degree of involvement responses were 49.1%, 47.8%, and 47.1%. The subsequent group was made up of Nurses and Internet Technologists who had 38.0% and 37.3% high extent of participation responses. It is somewhat surprising that Nurses did not belong to the same category as Physicians and Technology Officers, since like these, nurses are also equipment users and involved in direct patient contact and care.

The greatest proportion of low extent responses relative to all of the responses for the specific stakeholder type was attributed to the Community (41.3% of all community-related responses were low extent), Patients (34.8% of all responses were low extent) and the Board of Directors (32.6% of all responses were 'low'). Moreover, Lab and Patients received the highest ratios of non-applicability designation: in both cases, 23.9% of all respondents claimed that these were irrelevant to the technology assessment process. The

Community did not lag far behind: 19.6% of respondents believed that the community has no bearing on HTA.

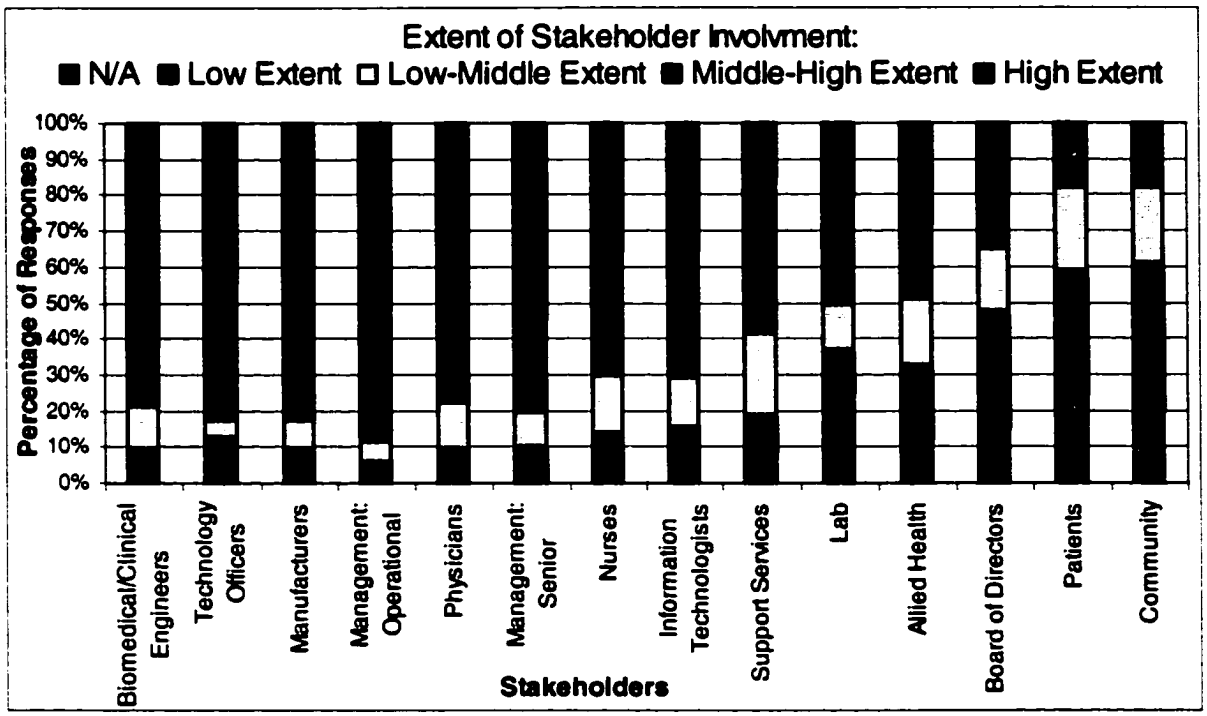


Figure 6. Stakeholder Involvement Profiles. All survey responses are reflected. For any given stakeholder, maximum possible sample size = 53 (number of "Yes" answers to question regarding acquisition of new/emerging technology within the past five years]); minimum number of responses=43. See Table 8 on page 55 for associated tabular data.

Textual commentary provided additional information regarding respondents' opinions on the significance of various stakeholders. (Sources are not identified as the survey request guaranteed anonymity and confidentiality). It is noted that management was considered to play an important role with regard to the financial aspects of health technology assessment and acquisition. Regarding operational management, respondents believed that this stakeholder managed "challenges in financing" and constituted both the "end users of patient care information" and the providers and users of "necessary data for orientation and decision-making". With regard to senior management, questionnaires outlined its role as "bridging the financial subject", "assuring adherence to the project

direction" and also stated that if there is "zero approval [on the part of this group], then change will not occur". The word "expertise" occurred frequently a propos biomedical engineering stakeholders: for instance, one respondent offered that they provide "necessary and very useful expertise". It thus follows that this stakeholder group had a high proportion of middle-high and high degree of involvement responses (78.8%). However, given that there were no similar (or, for that matter, any) annotations with regard to Manufacturers, it was unexpected that this stakeholder would have a higher amount of such responses (82.4%). On the subject of nurses and physicians as parties involved in HTA, completed surveys noted that their involvement impacted their "acceptance" and that the systems undergoing assessment "will affect them". Acceptance is a significant concept. As will be demonstrated later (§4.3.4 Stakeholder Involvement and Satisfaction), this factor impacts satisfaction.

With regard to the group of stakeholders to whom less than fifty percent of degree of involvement responses were in the category of middle-high and high, the comments were fewer in number, but no less significant in some instances. In the case of Lab, there were no remarks. Allied Health was merely identified as "user". Nonetheless, there was some telling commentary as regards the other three stakeholders. The Board of Directors stakeholder was identified as important in the sense that its approval is necessary to bring forth change. Patients were attributed the role of "priority setting" by one respondent. Several responses emphasized the critical role that the community plays in the financing of health technology initiatives: comments included such phrases as: "fundraising!", "for funding", "increased fundraising".

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	52	1.9%	11.5%	**13.5%**	13.5%	65.4%	**78.8%**	7.7%
Technology Officers (Equipment Users)	46	2.2%	4.3%	**6.5%**	34.8%	47.8%	**82.6%**	10.9%
Manufacturers	51	2.0%	7.8%	**9.8%**	35.3%	47.1%	**82.4%**	7.8%
Management: Operational	50	6.0%	6.0%	**12.0%**	34.0%	54.0%	**88.0%**	0.0%
Physicians	53	3.8%	13.2%	**17.0%**	28.3%	49.1%	**77.4%**	5.7%
Management: Senior	50	10.0%	10.0%	**20.0%**	22.0%	58.0%	**80.0%**	0.0%
Nurses	50	6.0%	16.0%	**22.0%**	32.0%	38.0%	**70.0%**	8.0%
Information Technologists	51	7.8%	13.7%	**21.6%**	33.3%	37.3%	**70.6%**	7.8%
Support Services	48	10.4%	22.9%	**33.3%**	41.7%	16.7%	**58.3%**	8.3%
Lab	46	13.0%	13.0%	**26.1%**	28.3%	21.7%	**50.0%**	23.9%
Allied Health	43	20.9%	18.6%	**39.5%**	18.6%	30.2%	**48.8%**	11.6%
Board of Directors	46	32.6%	17.4%	**50.0%**	13.0%	21.7%	**34.8%**	15.2%
Patients	46	34.8%	23.9%	**58.7%**	13.0%	4.3%	**17.4%**	23.9%
Community	46	41.3%	21.7%	**63.0%**	15.2%	2.2%	**17.4%**	19.6%

Table 8. Extent of Stakeholder Involvement. Maximum survey response set. Percentage distribution of responses on low-high scale. See Figure 6 on page 53 for corresponding graphical rendition of these data.

4.3.2 Greater Stakeholder Participation

The previous section discussed the evaluation of *actual* degrees of stakeholder involvement. In contrast, the succeeding analysis will examine respondents' indication of the *potential* value of additional stakeholder involvement. Contributors indicated that there is a requirement for more involvement on the part of medical staff. Over twenty percent (22.6%) of all respondents specified that the greater involvement of physicians *would* have been beneficial during the assessment and selection process. However, a number of respondents also noted that there was great difficulty in obtaining this group's involvement. In addition to physicians, there were four other stakeholders for whom more than ten percent of the survey responses asserted that their increased HTA participation would have added value. Relative to the physician data, not quite as many (17.3% of all respondents) reported the value in involving biomedical/clinical engineers to a greater extent. The other three stakeholders were Information Technologists, Nurses,

and Senior Management. The latter was unanticipated since eighty percent of respondents had already indicated a middle-high or high extent involvement on the part of this stakeholder – see previous section, §4.3.1, and Table 8. Absolutely no questionnaires specified a need to achieve greater involvement on the part of the Lab. Only 2.2% of respondents believed that patients should have been more involved in the process of HTA.

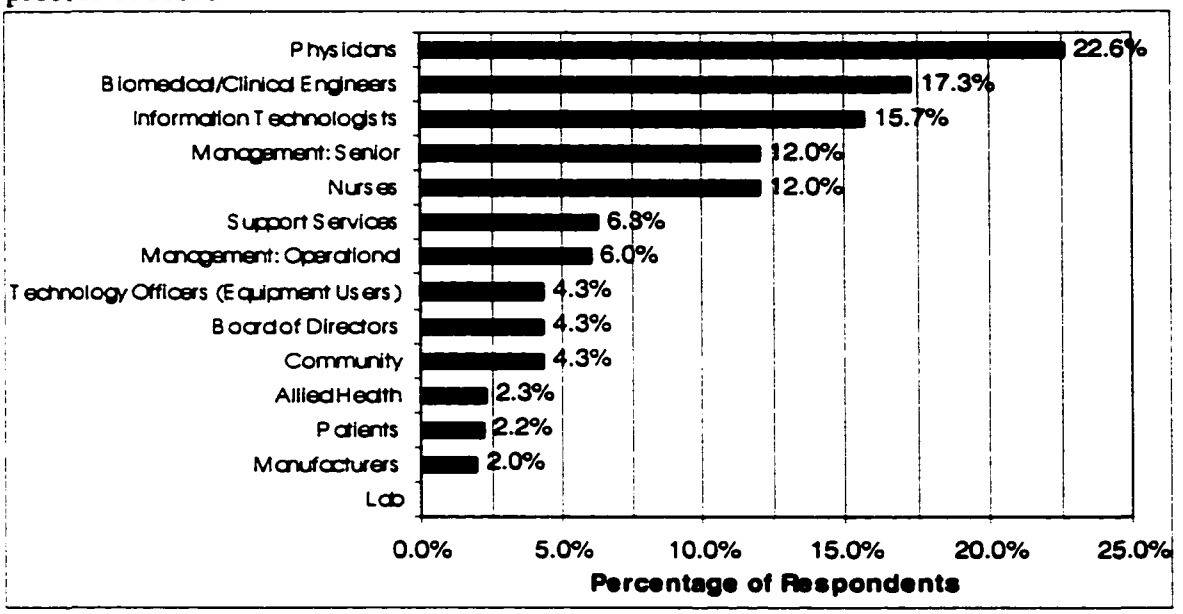


Figure 7. Percentage of all survey responses, which indicated that the greater involvement of the given stakeholder *would* have been beneficial during the assessment and selection process of HTA. Sample size = 54 (composition: 53 surveys associated with "Yes" answers to question regarding acquisition of new/emerging technology within the past five years + 1 "Not Yet" survey).

4.3.3 The Nature of Variation in Degree of Participation

4.3.3.1 Type of Technology

A number of respondents made comments suggesting that the composition and degree of participation of pertinent stakeholders varies depending upon the specific technology evaluation in question. Examples of such commentary include the following: "Depends on the technology who would be involved", "Involvement of each stakeholder depends on the type of equipment considered", and "All participate related to the degree of risk and reward in addition to knowledge". Based on such remarks, it was

hypothesized that a dependency relationship would emerge from the analysis of data by type of technology. For example, given that commentary associated with the function of Information Technologists (IT) as stakeholders included "determine limits of system" and "network impact", it should be the case that the PACS and HIS technology type categories should involve IT to a greater extent than the other types. Figure 8 (below and on the following page) depicts the stakeholder involvement profiles for each individual stakeholder and compares results across technology type categories.

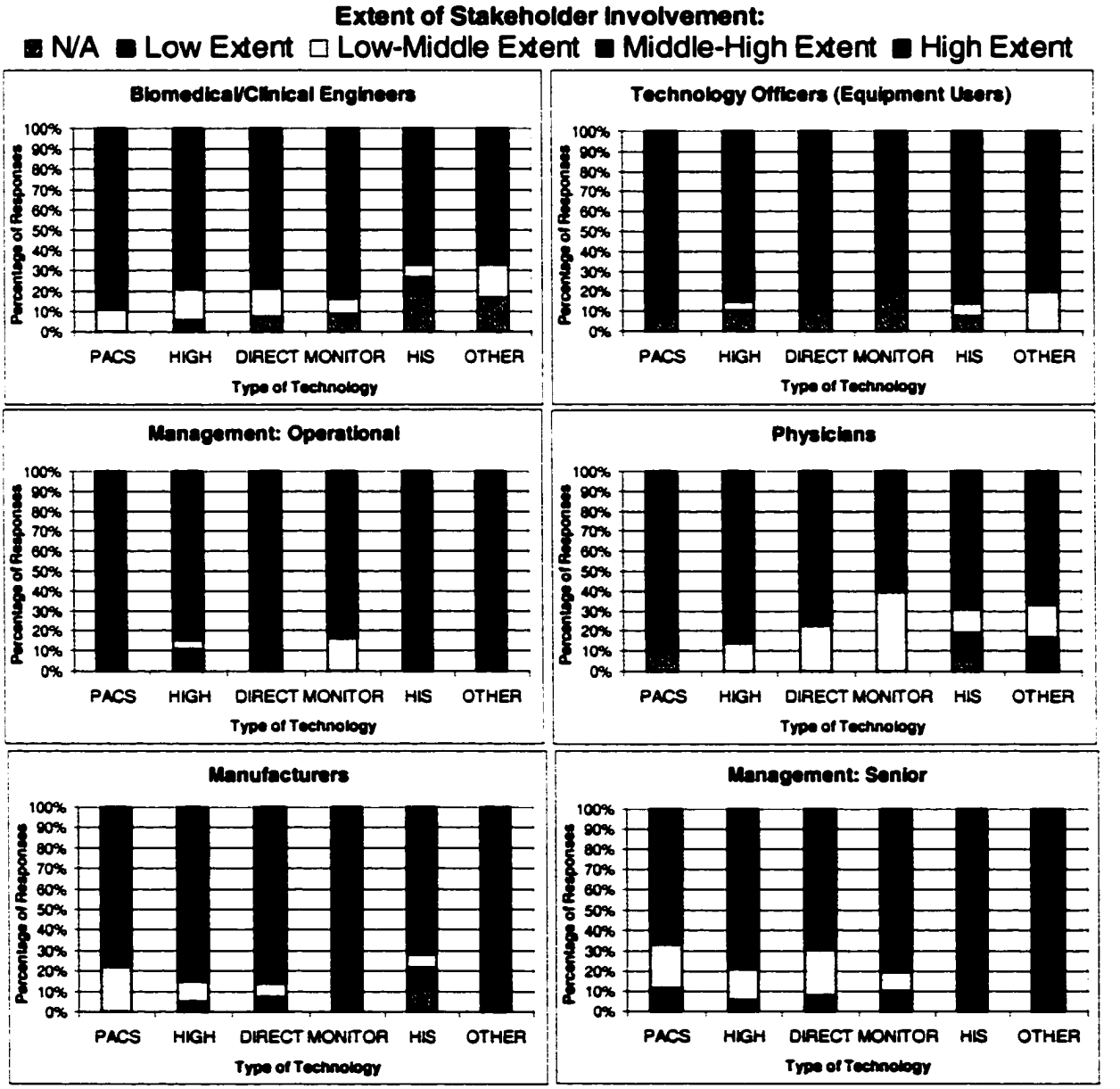


Figure 8. Composition of Extent of Involvement Responses for specific given stakeholders by Type of Technology. Continued on next page. See Tables C10 – C15 in Appendix C.4.1 for corresponding tabular data.

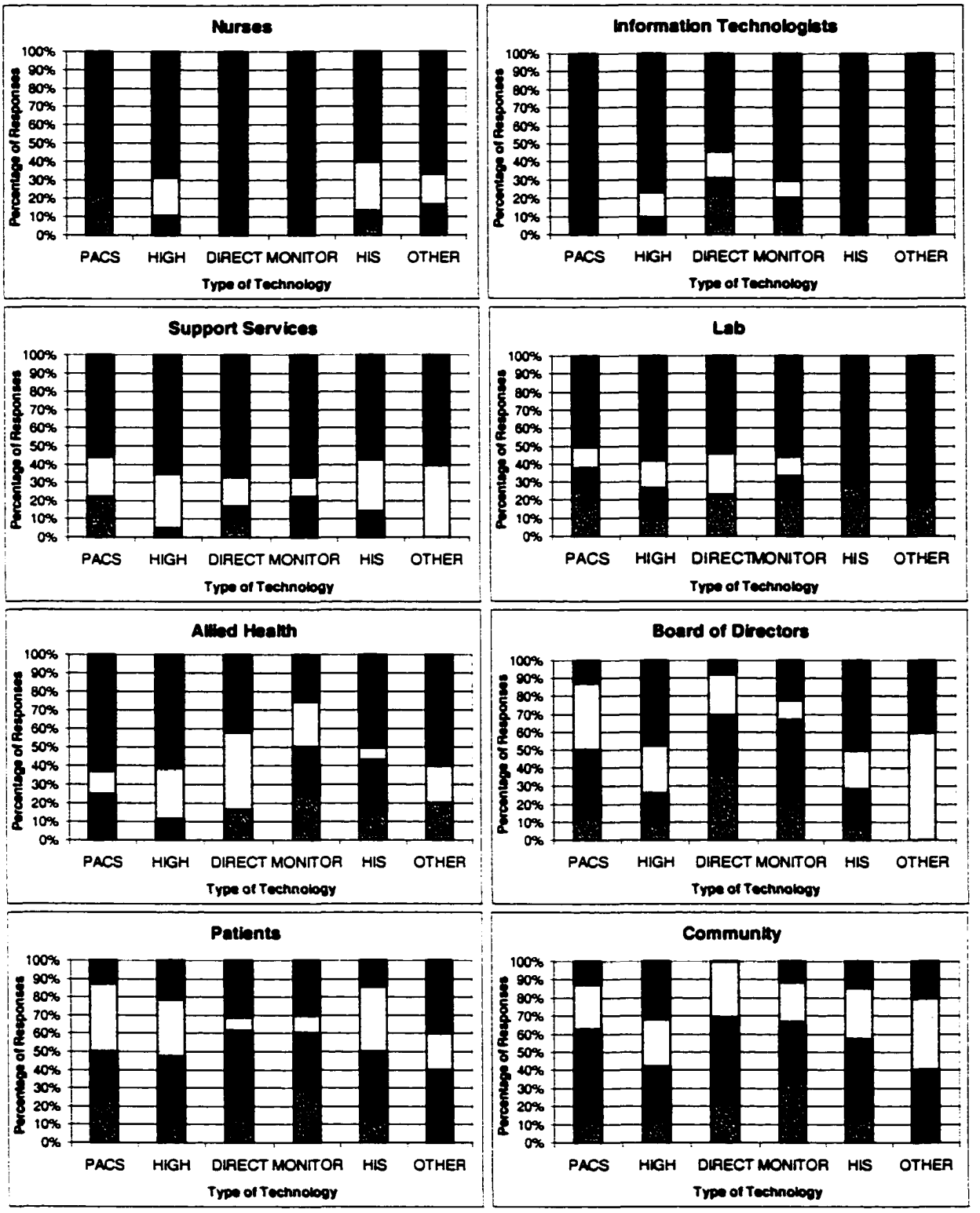


Figure 8. Continued from previous page. Composition of Extent of Involvement Responses for specific given stakeholders by Type of Technology. See Tables C10 – C15 in Appendix C.4.1 for corresponding tabular data.

In fact, there did appear to be a relationship between the type of technology and the extent of individual stakeholder involvement. This was most evident in the cases of nurses and IT. All of the responses regarding nurses' participation in HTA for MONITOR and DIRECT technology were middle to high and high. There were no instances of deemed non-applicability on the parts of nurses in the assessment process for these technology types. Conversely, the greatest proportion of non-applicable responses occurred in the case of PACS technology for this stakeholder group. It was expected that nursing stakeholder involvement would be highest in instances involving the technology and equipment, which nurses are most likely to use, namely those involved in the direct observation and care of patients. Since this group would not be as closely associated with PACS systems once functional, it follows that this technology category would present the group with the greatest proportion of non-applicability.

The physician stakeholder group profile was similar to that of the nursing group in that its only non-applicability responses also occurred in the cases of PACS and HIS technology. However, there were a greater proportion of high extent responses for physicians than for nurses in the case of HIGH technology. Meanwhile, in the case of patient monitoring technology, the converse was the case. Given the nature of their positions, physicians experienced greater involvement with the high technology category (which includes surgical equipment and technology), while nurses were more closely concerned with direct patient monitoring equipment and technology.

While irrelevance of physicians and nurses was raised only in the cases of PACS and HIS technologies, Information Technologists were most involved in the assessment processes associated with these technology types. In contrast, the only instances of non-

applicability responses for IT occurred for the DIRECT and MONITOR types (areas in which nurses and physicians were most involved). As PACS and HIS are network- and IS-intensive, the high proportions of middle-high and high extent responses were logical.

In the case of biomedical and clinical engineering, there was a relatively consistent profile across all six technology types. Along with the highest proportion of non-applicable responses, the smallest proportion of middle-high and high responses occurred in the case of HIS technology. It made sense for biomedical engineering stakeholders to be least involved (relative to their involvement in the cases of the other technology categories) in the assessment of hospital information systems technology as this is based more in information systems engineering rather than biomedical engineering.

The degree of participation profiles for technology officers was, for the most part, consistently predominantly middle-high and high. Given that these were the direct users of equipment, they should have been intimately involved in the HTA. It was, however, surprising that a number of respondents indicated that this stakeholder group was not relevant to assessment processes regarding monitoring technology. Management – both senior and operational – was consistently involved to a great degree in HTA. As mentioned previously, in no case was either branch of this group designated non-applicable to the process. The lowest proportion of middle-high and high extent responses occurred in the case of PACS technology for both senior and operational management. Manufacturers constituted another example of a stakeholder group, which constantly exhibited a high level of participation in the assessment process. The smallest proportion of middle-high and high extent responses occurred in the case of PACS

technology. Support Services and Lab also demonstrated consistent levels of middle-high and high degree of involvement responses.

Erratic profiles existed for the following stakeholders: Allied Health, Board of Directors, Patients, and Community. There was particularly great variability in the case of the board profile. The largest of its high extent response proportions arose in the case of HIS technology. This stakeholder appeared to be least involved in the instances of PACS and DIRECT technologies. With regard to patients, this group's largest proportion of middle-high and high extent of involvement occurred in three types of technology: DIRECT, MONITOR, and OTHER. The community was least involved in HTA processes regarding direct patient care technology. This stakeholder had the largest proportion of middle-high and high degree responses in the case of the HIGH technology category. As mentioned earlier, the community serves an important function in fundraising; perhaps its relatively high involvement in this technology type spoke to the large costs involved in acquiring and implementing high-end advanced technology. The only instance of high extent responses for the community stakeholder occurred in the case of HIS technology. It is possible that community involvement was sought for the purposes of evaluating and discussing confidentiality issues related to hospital information systems, or perhaps it was another instance connected to the topic of funding.

4.3.3.2 Type of Facility

Another possible reference frame for the evaluation of the extent of stakeholder involvement is Facility Type. However, the proportions of Technology Type were not equally distributed between Community and Teaching hospitals – see Table 7 on page 48. Given also that the relationship between type of technology undergoing assessment and

stakeholder participation has already been established, there is no means by which to independently compare extent of stakeholder involvement on the basis of Facility Type.

4.3.4 Stakeholder Involvement and Satisfaction

There is a relationship between individuals' extent of involvement in the assessment process and their subsequent satisfaction with the implementation of the selected technology. Data were aggregated separately in the cases of two stakeholder groups: nurses and physicians. The extent of stakeholder involvement was selected as the independent variable and the extent of the group's satisfaction (as determined from the submitted responses to the "New and Emerging Technology – Measurement of Success" section of the questionnaire) was the dependent variable. These data were tabulated on an individual questionnaire basis; satisfaction was compared with involvement on a discrete case basis, i.e. it was not the case that the total extent of involvement profile was compared with the cumulative level of satisfaction profile. Rather, the data points from individual surveys were plotted: for example, if a questionnaire responded a low extent of involvement on the part of nurses in the assessment phase, then the level of satisfaction

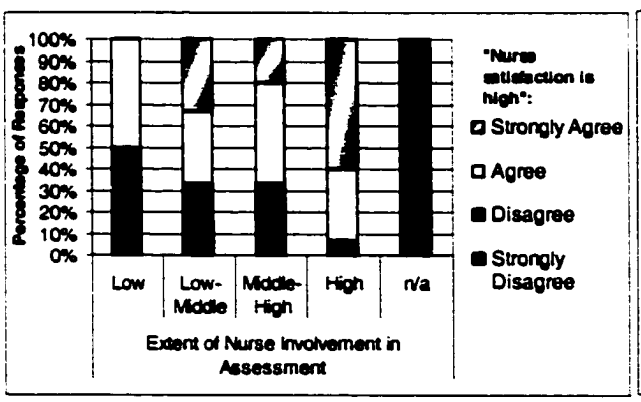


Figure 9. Nurse satisfaction with implemented technology as a function of the extent of nurse involvement in the assessment process. Sample size = 45.

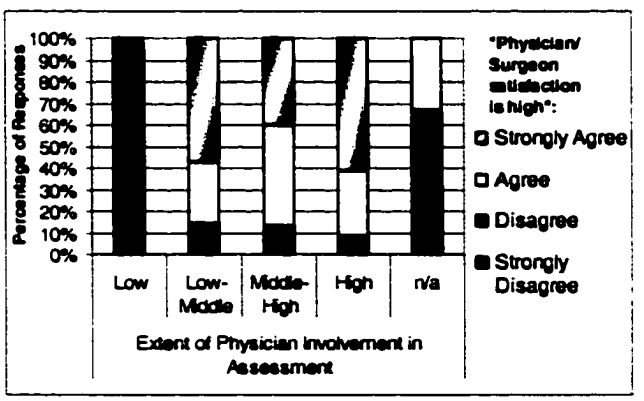


Figure 10. Physician satisfaction with implemented technology as a function of the extent of physician involvement in the assessment process. Sample size = 53.

(dependent variable) on the part of nurses in the same survey was tabulated in the low extent of involvement (independent variable) portion of the graph. Results appear in Figures 9 and 10 on the previous page. See Appendix C.4.2 for related data in tabular format. The trend was particularly apparent in the case of the nurse stakeholder group. The greater the degree of involvement on the part of nurses in the assessment phase of health technology acquisition, the greater their level of satisfaction with the technology once implemented. In instances where their involvement was deemed non-applicable, there were no cases of middle-high or high degree of satisfaction. The physician profile did not exhibit the dependency of satisfaction on involvement to the same degree as did the nurse profile. Nonetheless, in all cases of low physician assessment participation, there was only a low level of physician satisfaction and the greatest proportion of high level of satisfaction occurred for the case of high extent of participation.

4.4 Levels of Importance Attributed to Factors Involved in Health Technology Assessment

The questionnaire probed hospitals' prioritization of various factors in the evaluation process. The overall apparent order of importance (from greatest to least) was as follows: potential to improve patient care, cost, security and safety, IT/IS interconnections, ergonomics/user friendliness, master facility plan of hospital, legal information/ standards, service contracts, infection control. The average level of importance attributed to the concept of improving patient care was 3.9 ± 0.3 (on the four-point scale). Patient care received the greatest proportion (87.3%) of high extent responses relative to all of the responses for that factor. No responses ascribed a low or low-middle level of importance to this issue. This was an encouraging result since hospitals should indeed be focused on the provision of quality patient care. The factor for

consideration with the next highest proportion of high extent responses (56.6%) was security and safety. Infection control was the issue, which received the greatest relative proportion of low-level responses (20.8% low and 17.0% low-middle level).

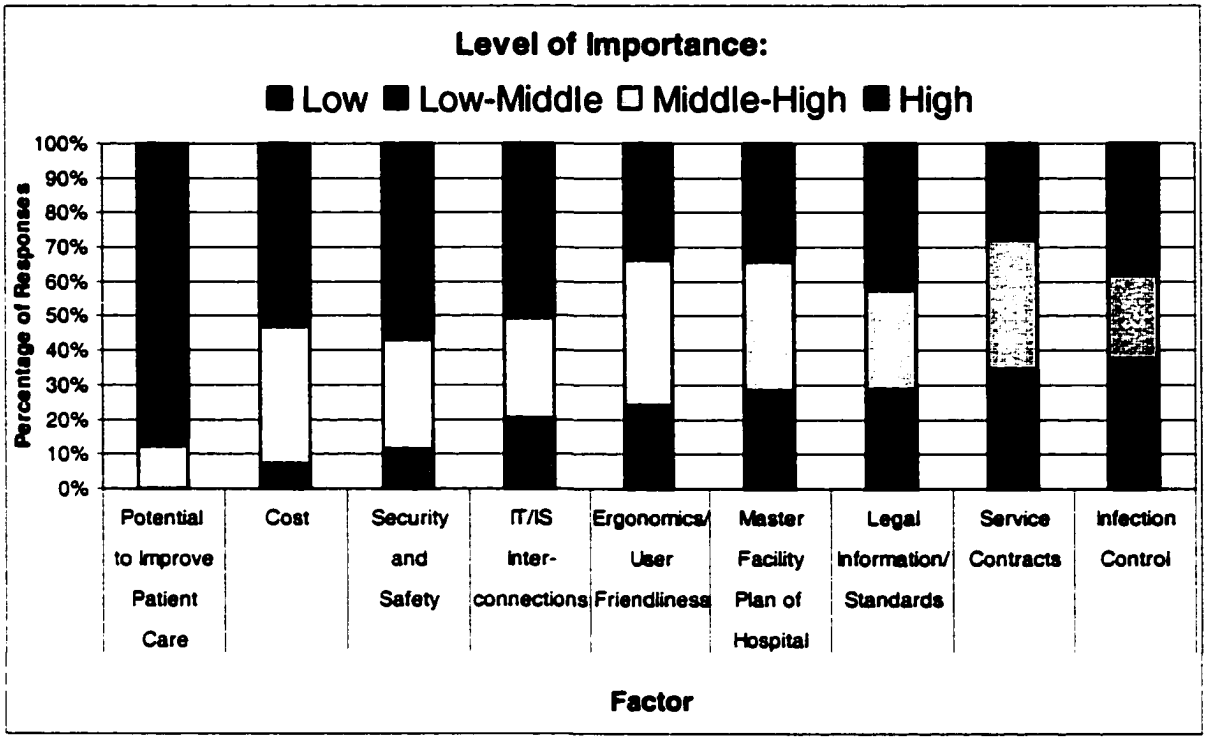


Figure 11. Response Profile for Levels of Importance attributed to various factors in the HTA process. All survey responses are reflected (includes "Yes" and "Not Yet" answers to question regarding acquisition of new/emerging technology within the past five years). For any given factor, maximum possible sample size = 55; minimum number of responses=52. See Table C18 in Appendix C.5.1 for associated tabular data.

4.4.1 Type of Technology

In terms of the response profiles associated with specific technology categories, it was often the case that those for the DIRECT and MONITOR types were similar. Comparable bars for these two technology types occurred in the cases of the following considerations: Legal Information/Standards, Service Contracts, Security and Safety, and to a certain extent Infection Control (see Figure 12 on the following page). Related to

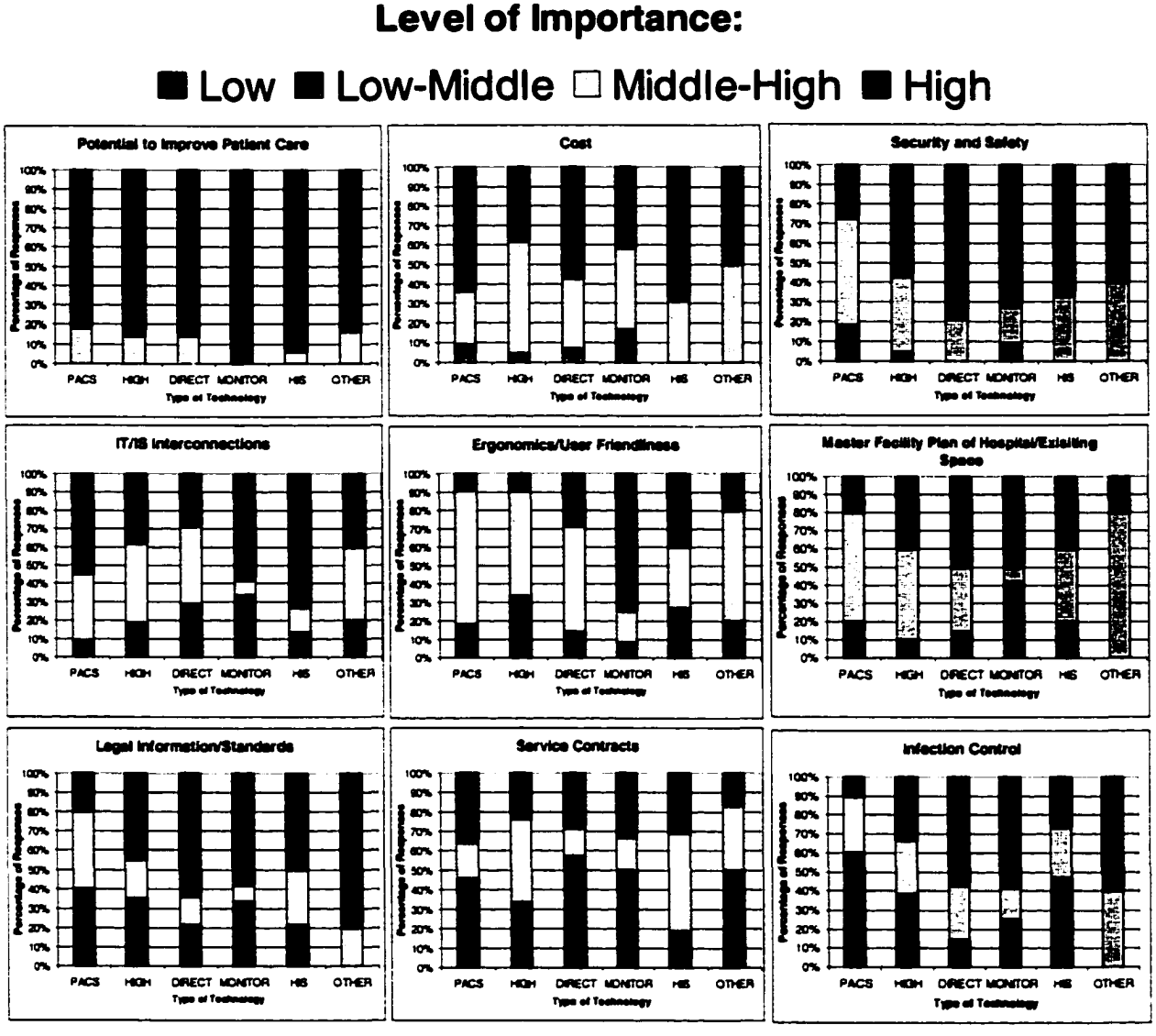


Figure 12. Composition of Level of Importance Responses for specific given factors by Type of Technology. See Tables C19 – C24 in Appendix C.5.2 for corresponding tabular data.

these two technology types were the greatest proportions of high responses for Security and Safety and Master Facility Plan of Hospital/Existing Space. The two types also shared a similarity with regard to Service Contracts: the least importance appeared to be attributed to this consideration by both of these technology categories. In terms of Infection Control factors, DIRECT and MONITOR (along with OTHER) had the highest proportion of their responses designated high level. It was surprising that a number of the replies associated with DIRECT technology attributed a low level of importance to this

factor. One would think that devices, which are in direct contact with patients would be subject to stringent infection control protocol. The monitoring category received the largest proportions (relative to the other five technology types) of high-level responses for both Potential to Improve Patient Care and Ergonomics/User Friendliness. The reason for the importance placed upon ergonomic considerations vis-à-vis monitoring technology was not necessarily evident, but it is possible to argue that the patient care aspect was logical as patient monitoring technology may have the most direct and immediate ability to impact patient care.

The response profiles with regard to cost issues varied somewhat across technology types. HIGH technology received the smallest proportion of high-level responses; the question arises whether or not this speaks to the notion that perhaps hospitals did not expect to save money by implementing new high-end technology. The nature of this response may also indicate that health technology assessors did not allow the costliness of high technology equipment to impede their assessment and/or stop the contemplation of acquisition.

The technology specific nature of HTA process considerations was further demonstrated by the IT/IS Interconnections and Master Facility Plan of Hospital/Existing Space response profiles for the technology categories PACS and HIS. In the case of existing space considerations, the two named technology classes received the greatest proportion of low-level responses. These types are more network-based; while computers and servers require room, perhaps they do not require as much physical space as required by large machines (or even a large number of smaller units of equipment) associated with the other technology types. Moreover, while it is recognized that

additional hardware may be necessitated by software upgrades and computer systems innovations, the requirements may be few or unnecessary in some instances; i.e. new software and systems can be implemented and accommodated by existing computer workstations and servers. In the case of IT/IS interconnectivity planning, it was a reasonable result for HIS and PACS technology to have the largest proportion of high level responses since information and communications systems, by definition, rely upon IS and network linkages and functioning.

With regard to ergonomics issues and service contracts, it was surprising that across technology types, significant proportions of responses indicated that planners did not consider these factors to be of much importance. Service of technology and related equipment contributes significant costs; lack of adequate attention paid to negotiating sound service contracts can potentially result in unmanageable expenses in future. Ergonomic and user-friendliness impact the willingness of technology users to actually employ the new technology; if it is difficult or uncomfortable for users to utilize, then they will be reluctant to do so. The value of the novel technology is then reduced. Another unexpected result is the response profile for Legal Information and Standards in relation to PACS technology: planners should have been mindful of the legal ramifications associated with the electronic transmission of sensitive patient data.

4.5 Equipment Considerations

The questionnaire investigated hospitals' perception of the importance of various equipment considerations to the evaluation process. The overall apparent prioritization of such considerations (in order from greatest to least) was as follows: training requirements, upgrade paths, product options, expandability, parts, various vendors,

service agreements, various service providers, disposability considerations. The level of importance attributed to cost was not included in this section of the questionnaire; it occurred in the previous section (Factors for Consideration) in reference to the overall technology, not just the equipment considerations aspect. The survey also required respondents to specify any other equipment factors, which they regarded as issues for consideration in technology assessment. The following list depicts the composition of the "other" such factors detailed in the collection of completed questionnaires: compatibility with existing systems/equipment, throughput, reliability, operating and maintenance manuals/schematics, local vendor support, experience of equipment in other hospitals, regional compatibility, portability, image quality, life cycle cost, revenue generation, transportability to newer facility in future, potential to meet future needs.

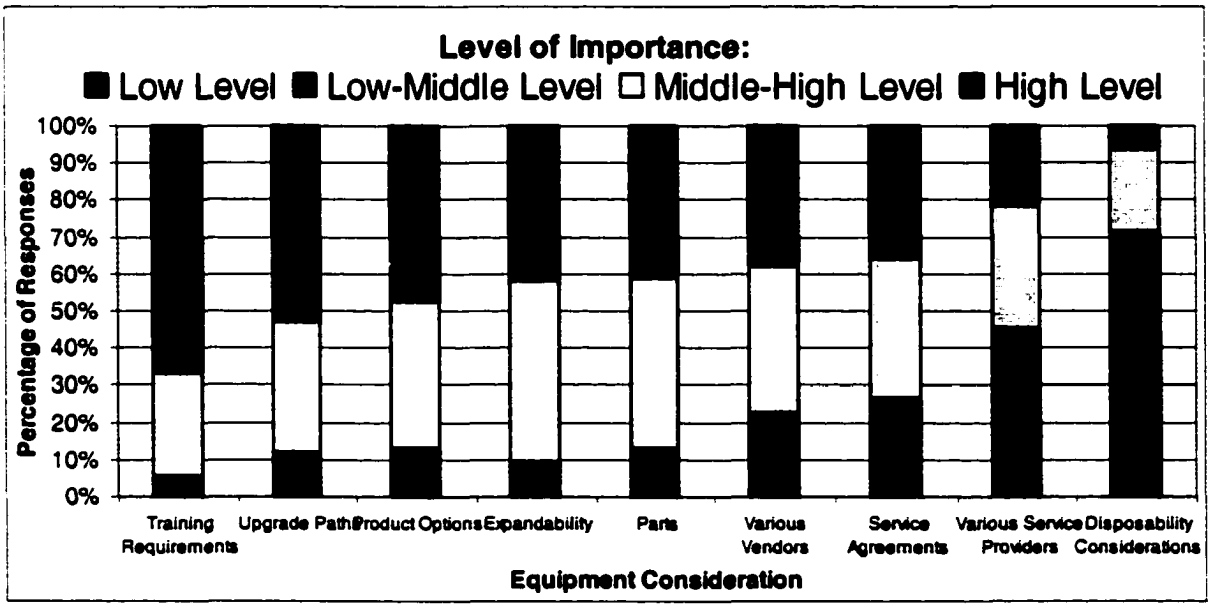


Figure 13. Response Profiles for Levels of Importance attributed to various Equipment Considerations in the HTA process. All survey responses are reflected (includes "Yes" and "Not Yet" answers to question regarding acquisition of new/emerging technology within the past five years). For any given equipment consideration, maximum possible sample size = 54; minimum number of responses=49. See Table C25 in Appendix C.6.1 for associated tabular data.

Training requirements were identified as one of the most important factors on the basis of their response profile: 66.7% of the replies for this category were high level and 94.4% were either middle-high or high. Upgrade and adaptability matters were also identified as significant issues (both by the response profile for upgrade paths [88.2% of responses were either middle-high or high] and also by the comments made in response to requests for listing of "other" considerations). Service agreements did not rank overly high in importance; this may have been a result of the fact that a lot of service was to be performed in-house – several survey respondents noted this. However, in the cases of respondents who did not specify in-house servicing, again the question arises as to whether or not individuals charged with the responsibility of planning new technology acquisition truly comprehended the real costs involved. Parts considerations were similarly surprisingly ranked at a low level of importance by a significant number of respondents; yet, the replacement of obsolete technology parts was identified as a driving factor for new and emerging technology acquisition (c.f. §4.2 Driving Factors and the Value of New Technology). Disposability considerations were identified as being of low importance (71.4% of responses were either low or low-middle: 44.9% low; 26.5% low-middle). A lack of comprehension may have contributed to the composition of this profile: some respondents claimed that "disposability considerations" was vague. As written in the survey, it was intended to address both waste management matters (e.g. of hazardous chemicals and biological agents) and recycling and/or disposal requirements associated with equipment components and attachments (e.g. probes, needles, test strips, etc.).

4.5.1 Type of Technology

Profiles for equipment considerations varied according to the type of technology involved. As was the case for factors for consideration (see previous section, §4.4 Levels of Importance Attributed to Factors Involved in Health Technology Assessment), with regard to the equipment consideration response profiles associated with specific technology categories, the DIRECT and MONITOR types often had similar patterns. (Refer to Figure 14 on the subsequent page). For example, in the case of Various Vendors, DIRECT and MONITOR almost had identical profiles; in both cases there were no low or low-middle responses. By itself, the MONITOR category obtained the greatest proportions of high responses (relative to the other technology types) for all of the following considerations: expandability, parts, product options, and training requirements. The least percentage of high responses for training requirements occurred for the PACS group. However, PACS and HIS had the largest percentage of high responses for upgrade paths. With regard to issues surrounding equipment parts, the DIRECT and OTHER technology categories were the only ones for which there were no low and/or low-middle responses. Of the set of considerations evaluated, the most consistency (in response profiles across technology types) occurred for service agreements; this was at least the case in terms of proportion of high-level responses across technology groups.

The response profiles for PACS technology – specifically with regard to the following equipment considerations – various vendors, expandability, parts, and upgrade paths – were somewhat alarming. According to Dr. Neil Johnson, Chief Medical Advisor, Clinical Informatics at the Children's Hospital Center in Cincinnati, one of the

keys to successful PACS implementation is "careful selection of various vendors for what was assumed to be a 15 or 20-year marriage" (Rabinovitch, 2001).

> Changing vendors sooner than 15 years... is a prospect too horrible to contemplate. Therefore, the PACS supplier must be a stable company with long-term vision and commitment, substantial resources for development, and an aggressive approach to upgrades. (Rabinovitch, 2001).

Despite this, only a small proportion of respondents describing PACS technology indicated their belief that it was important to compare proposals from various vendors. In addition, a significant fraction of survey responses detailing PACS systems assessment

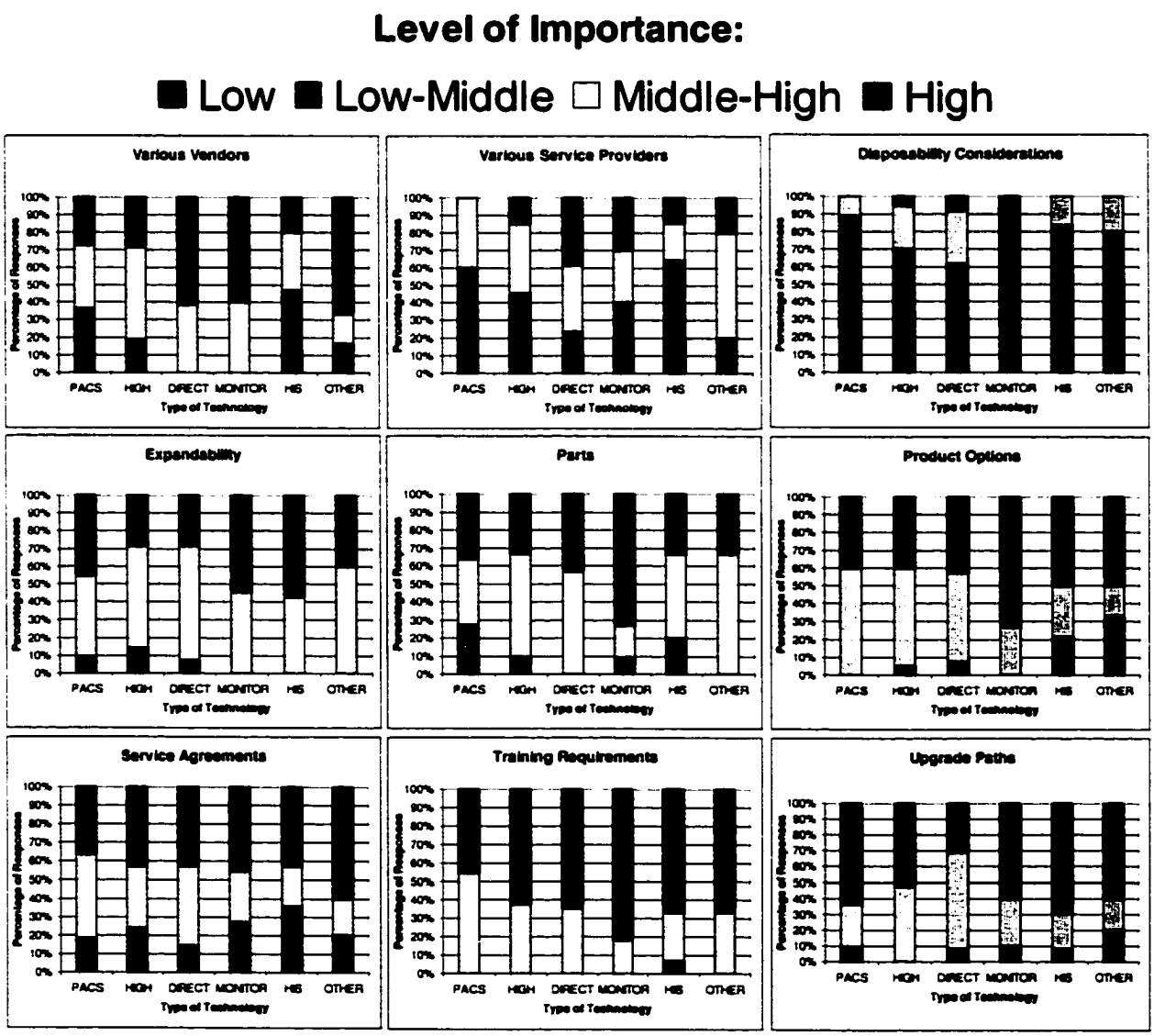


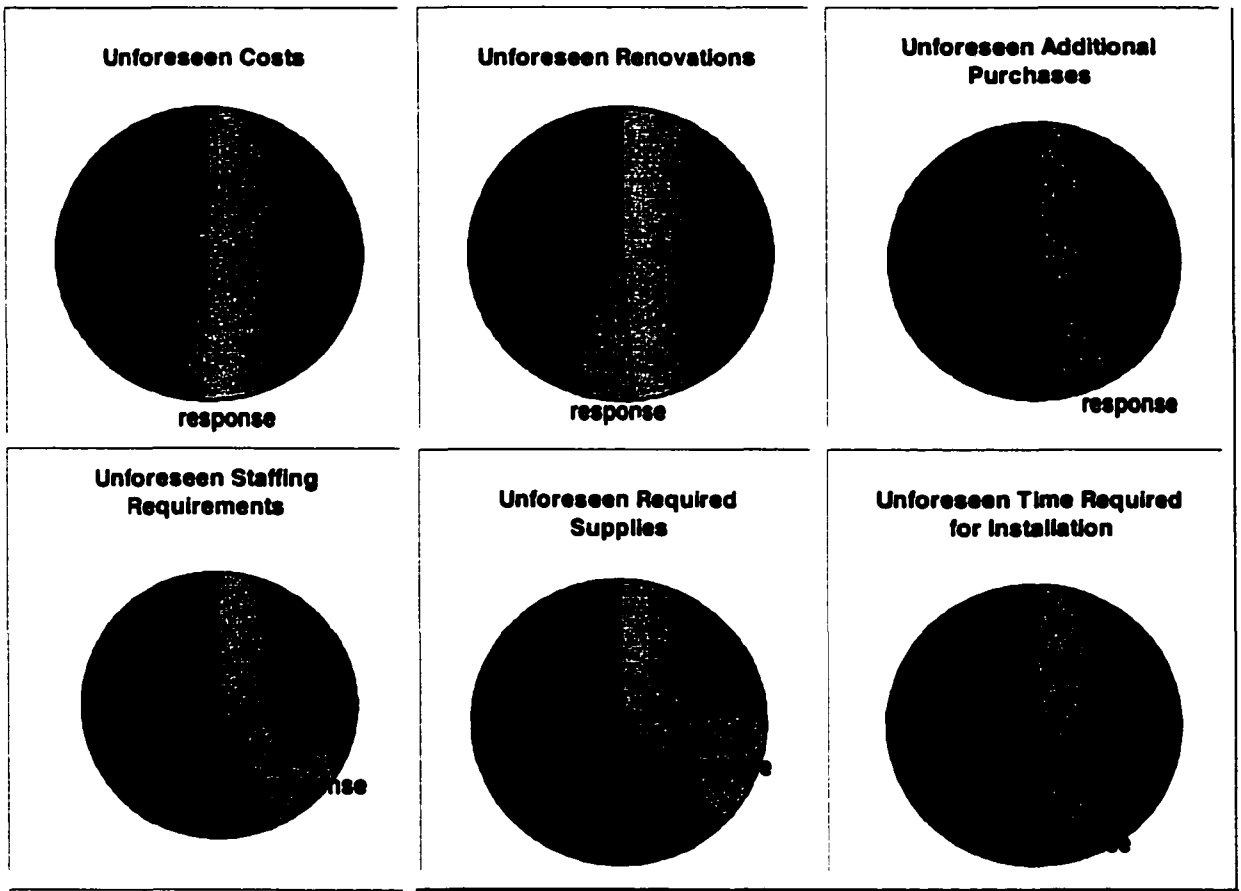
Figure 14. Composition of Level of Importance Responses for specific given equipment considerations by Type of Technology. See Tables C26 – C31 in Appendix C.6.2 for corresponding tabular data.

processes indicated upgrade paths and expandability considerations ranked either low or low-middle in import. Furthermore, the lack of consideration afforded parts considerations was disquieting: planners' ignorance would have prevented them from realizing that their hospital's diagnostic and therapeutic imaging capabilities would be completely reliant upon the PACS system being reliable (being serviceable and having required parts available).

4.6 Unforeseen Circumstances

Certain respondents claim to have prepared adequately against the occurrence of unforeseen circumstances, for example "We foresaw all challenges" and "Everything was dealt with upfront before purchase. Depending 5 or 6 departments should sign off then there should be no surprises". Yet, others express a view that 'unforeseen' incidents are simply inherent in any new technology acquisition and implementation process: "Most emerging medical technologies require a significant amount of additional effort during early stages. Hospital staff and even vendors sometimes unsure how best to handle implementation"; "If unforeseen circumstances are expected then their occurrence is not unforeseen. When installing new technology, one must always expect unknowns". This latter line of thought is contentious. It is more reasonable to argue, as did one survey response, that "Better planning would allow for a minimum of unforeseen circumstances". Another questionnaire reply echoed the opinion that the execution of sufficient and comprehensive planning lessens the degree of unanticipated situations: "There were unforeseen circumstances, however, these were minimized due to the time taken in the planning stages".

Some surveys detailed and attempted to explain specific instances of unexpected predicaments. With regard to training, pertinent issues included: the difficulties encountered in training MDs who are not on staff and do not attend sessions and later require training by ER staff, and changes in nursing staff, which "provide a need for



Circumstance	Number YES	NO	No response	Percentage YES	NO	No response
Costs	26	24	1	51.0%	47.1%	2.0%
Renovations	25	22	4	49.0%	43.1%	7.8%
Additional Purchases	20	27	4	39.2%	52.9%	7.8%
Staffing Requirements	16	29	6	31.4%	56.9%	11.8%
Required Supplies	12	32	7	23.5%	62.7%	13.7%
Installation Time	21	25	5	41.2%	49.0%	9.8%
Training Requirements	21	26	4	41.2%	51.0%	7.8%

Table 9. Absolute numbers and percentages of responses regarding the occurrence of unforeseen circumstances during implementation. Each condition is independent of the others.

Figure 15. Incidence of unforeseen circumstances during implementation of new technology. The composition of responses for each given condition is independent of all of the others. Table 9 lists the absolute numbers and percentages associated with the charted response profiles. Sample size = 51.

constant training and orientation". In the case of renovations, one comment was that a greater number of air conditioning units were required to cool the equipment and that the installation had been projected "inaccurately related to age of the building". Some individuals held suppliers culpable: "Vendors do a poor job of covering off everything needed"; "Even if there is conformity to the submission, the supplier always justifies additional costs. We have to better describe our needs and more importantly, our expectations". Conversely, certain respondents indicated factors to which they attributed their avoidance of unanticipated conditions: regarding costs, the employment of a "tight contract"; regarding training: "incentive clause was beneficial".

The lowest incidence of unforeseen predicaments was associated with supply requirements: 62.7% of respondents reported no such unexpected events. On the contrary, the most unpredicted conditions arose in the case of costs. More than half (51.0%) of all respondents indicated the occurrence of unforeseen costs during their technology implementations. It is difficult, or perhaps impossible, to ascertain the constitution of the unpredicted costs. The unforeseen costs may result from any combination of the other unexpected circumstances detailed in Figure 15 on the previous page and Figure 16 on the next page. In some instances, it is possible that none of these factors contributed to extra costs. In the 'Equipment Considerations' section of the questionnaire, one respondent specified "cost of training included in capital cost", but it is not known whether or not other HTA processes conducted by other survey respondents made the same inclusion. Some textual commentary identified additional expenses resulting from ad hoc costs presented by suppliers. Others indicated that system unreliability and the need for constant upgrades effected supplementary costs.

4.6.1 Type of Technology

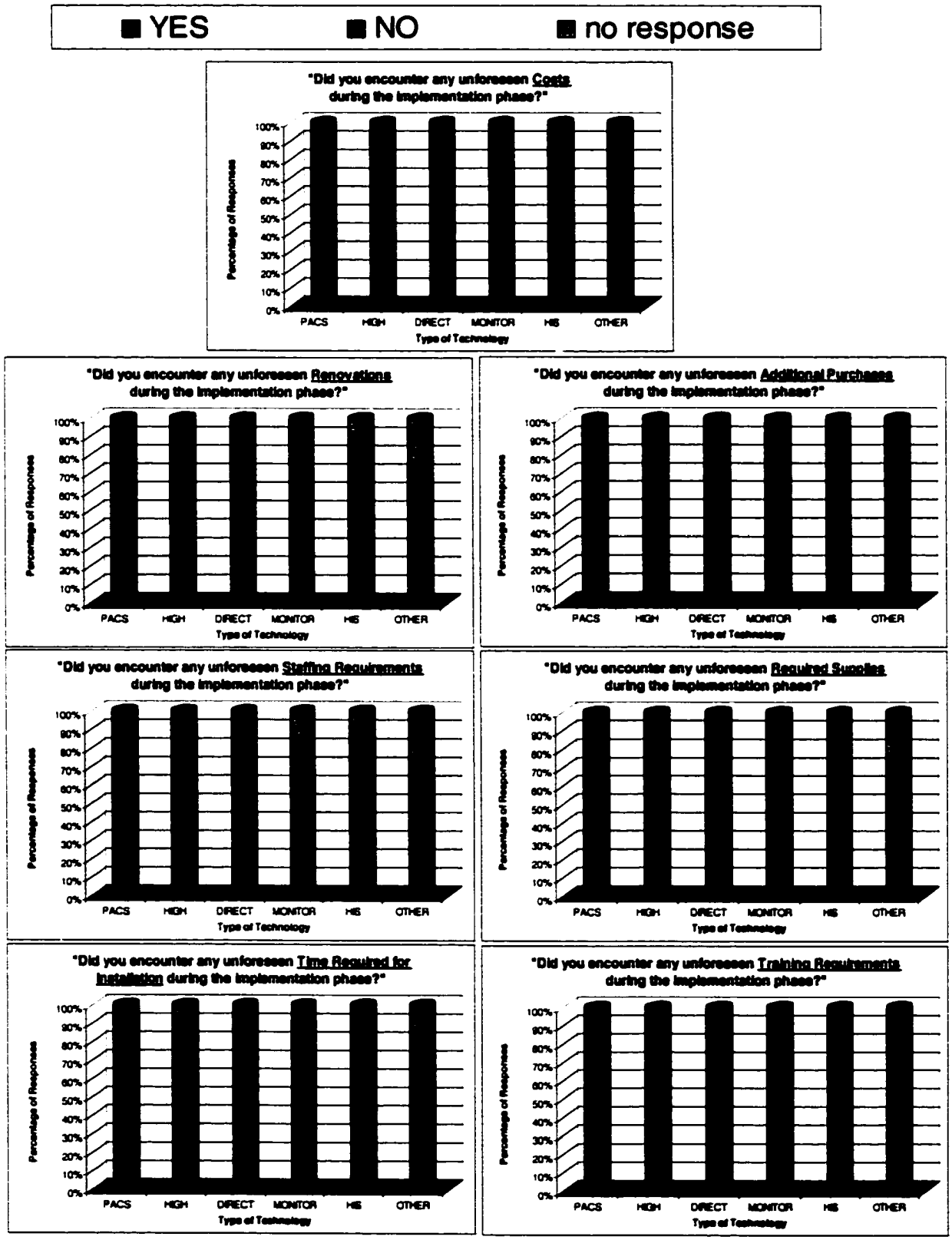


Figure 16. Composition of Unforeseen Circumstance Responses for specific given circumstances by Type of Technology. See Tables C32 – C37 in Appendix C.7.1 for corresponding tabular data.

The greatest prevalence of unforeseen cost circumstances occurred in the cases of PACS, HIS, and OTHER technology. With regard to unexpected training requirements, the types of technology, which encountered the greatest relative incidence are HIS and OTHER.

Again, DIRECT and MONITOR shared similar response profiles in some instances. The highest proportions of unforeseen circumstances (i.e. 'yes' responses) occurred with regard to renovations and installation time for both of these categories. In the case of HIGH technology, the greatest incidence of unanticipated situations arose regarding cost and renovation issues. This was the same case for PACS technology.

Overall, the technology type with the lowest frequency of unanticipated circumstances (as determined by calculating the average percentage of 'no' responses over all given conditions for each technology type) was HIGH. The technology type with the highest frequency of unexpected predicaments (as determined by calculating the average percentage of 'yes' responses over all given conditions for each technology type) was HIS. See Appendix C.7.1, Tables C32 through C37.

4.6.2 Cause and Effect Relationships

4.6.2.1 Training Requirements

The average level of importance (over all available responses) attributed to Training Requirements as an Equipment Consideration was 3.6 ± 0.6. Given this high level of importance, it was surprising that unforeseen training requirements were encountered by over forty percent of respondents. In order to assess the possibility of a relationship between process (i.e. assessment) and results (i.e. implementation) with regard to training, data were aggregated where level of importance placed on training requirements was the independent variable and presence of unforeseen circumstances as

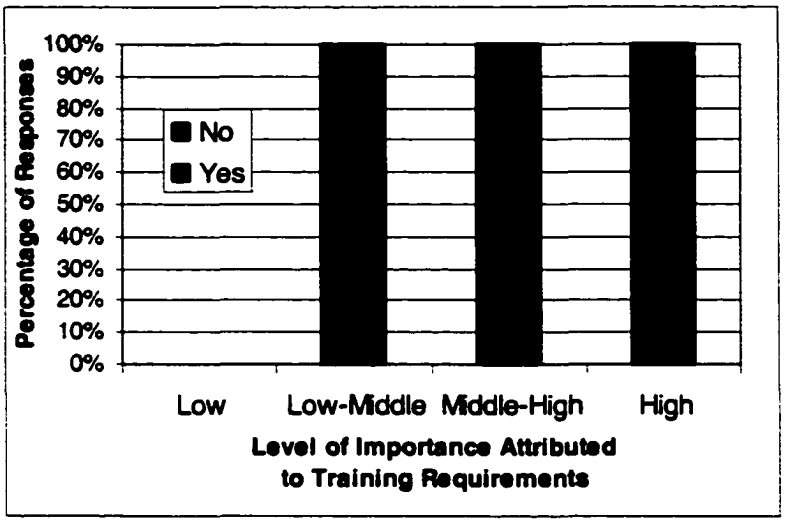


Figure 17. Incidence of unforeseen training requirements as a function of the level of importance attributed to the equipment consideration training requirements during the assessment process. Sample size = 44.

regards training requirements was the dependent variable. As this analysis was conducted for the purposes of dependency evaluation, only the foreseen/unforeseen responses for which there were corresponding responses regarding the level of importance attributed to the consideration of Training Requirements in the same questionnaires were included. The resulting trend is such: the greater the level of importance placed on training requirements during the HTA, the less the incidence of unforeseen circumstances during implementation. As demonstrated in Figure 17 above, unforeseen training requirements arose during implementation in all cases in which a low level of importance had been assigned to this issue during the assessment phase. Furthermore, the greater the level of importance designated during assessment, the less the occurrence of unforeseen situations.

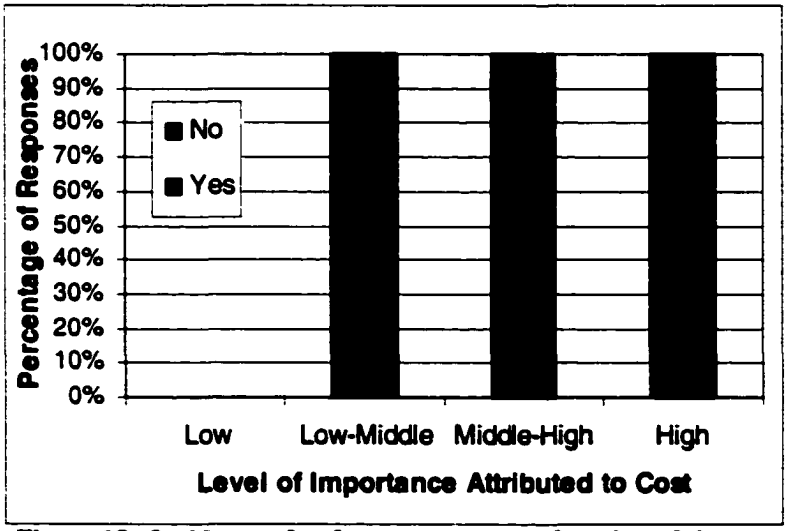


Figure 18. Incidence of unforeseen costs as a function of the level of importance attributed to the factor cost during the assessment process. Sample size = 50.

4.6.2.2 Cost

Similarly, for the purposes of assessing the possibility of a correlation between process (i.e. assessment) and results (i.e. implementation) with regard to costs, data were aggregated where level of importance placed on cost considerations was the independent variable and presence of unforeseen cost circumstances was the dependent variable. Only the foreseen/unforeseen responses for which there were corresponding responses regarding the level of importance attributed to cost considerations in the same questionnaires were included. The trend (as depicted by Figure 18 on the previous page) was similar to that identified in the aforementioned case of training requirements. The greater the level of importance placed on cost issues during the assessment phase, the lower the frequency of unexpected cost-related issues during implementation.

4.7 Satisfaction with Technology and Equipment

Of all of the responses provided in the "Implementation of New and Emerging Technology" section of the questionnaire, 18.4% indicated that the technology and associated equipment did not meet expectations. Notably absent from the group of respondents who indicated such dissatisfaction were members of the SENIOR respondent position category. Of the group of respondents who indicated that given technologies were not meeting expectations, 42.9% indicated that additional stakeholder involvement would have been beneficial. The implementation strategy employed – i.e. immediate versus phased-in did not appear to significantly impact results. However, there were a greater number of favorable responses in the case of immediate introduction as compared with phased-in implementation (thirty-six versus twenty-four). The converse was true for the non-attainment of expectations cases: there were more phased-in than immediate responses (seven versus six). Refer to Appendix C.8.

4.8 Adequate Consultation and Additional Involvement

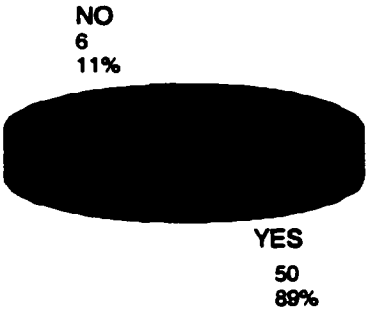


Figure 19. Distribution of Respondents' Opinions regarding their sufficient consultation in their facility's HTA process(es)

The questionnaire asked respondents to comment upon whether or not they believed that they were sufficiently consulted and that their expertise and contributions were optimally employed. A high proportion, 89.3%, of all participants (who had completed the questionnaire in its entirety, i.e. did not answer 'no' to the recent acquisition of new technology question) indicated that they were adequately consulted and that their knowledge was advantageously utilized. While there was a relatively equal distribution of insufficient consultation responses among the various respondent position types, the majority of such responses arose from individuals responding on behalf of teaching hospitals.

Whereas a high proportion of survey contributors specified their sentiment of satisfactory consultation, some of their associated comments suggested that they may have answered "maybe" or "sometimes" had such choices been offered in addition to the simple opposites "yes" and "no", which were the only response options available. Associated comments from respondents who exclusively indicated "yes" included the following: "I could be more intimately involved in the process. Lack of time as I am also in charge of Information Systems"; "At times projects move forward without my knowledge but generally I am involved"; "Conditional yes. On occasion the physicians and some other managers acquire equipment/technology without consulting all of the other stakeholders"; "Usually! Some pieces can be acquired without the involvement of

the engineering group but these are typically less significant acquisitions"; and "Generally speaking. Occasionally someone decides to 'go it alone' and not work with the various support teams. This invariably leads to problems". Again, this reaffirms the paramount importance of stakeholder participation.

Commentary from participants who replied that they did not feel adequately consulted included: "I was not able/allowed to give full recommendations with regards to other needs such as server location, network requirements and millwork requirements"; "...some managers resent the encroachment of the I.S. department into their territory. They have to be prodded into using advanced systems technology."; "not always involved, until equipment is on site and then we need to educate patients as our staff book appointments"; "With limited capital available, capital plan not being followed, limited involvement of the 'Priorities' committee".

In addition, questionnaire recipients were asked for their opinion regarding additional means by which they would have liked to have been involved or would like to be involved in future assessment processes. These varied by respondent position type. Biomedical/Clinical engineering positions reported the following: "Technology planning and be able to instruct the proper people to do the job right"; "in the planning of the enlargement of new research labs"; "I would do more ongoing communication with the different departments and provide them with feedback about technology, current and future"; "Biomed should be involved in the evaluation stage for high-end lab and x-ray equipment and technology"; "Capital planning: setting aside required financial resources". One of the Information Technologists responded that, "If a systems professional is included from the beginning of an initiative, they can inform those

involved about current equipment or software available. There have been new implementations using legacy equipment – we could have avoided this had I been consulted and could have saved money in the long run". An individual from the SENIOR category expressed his/her wish to be involved "earlier" in the process. Support staff commentary included the following: "When other departments research and order equipment, we should be consulted first if we are to install equipment"; "The customer or consumer of IT must be satisfied with the product, or it is useless". It appears that a higher level of communication and more integrated involvement of stakeholders would have benefited HTA.

As will be demonstrated in the subsequent section (c.f. §4.9, Figure 20), it was not the case that one hundred percent of respondents reported strong agreement with the questionnaire statements addressing the success of implemented technology. A high proportion of respondents indicated their sufficient involvement, yet there were cost overruns (c.f. §4.6) and a lack of 100% success rates – do people think that they have done all that they could have and feel that it was *someone else's* problem and/or responsibility? In fact, textual commentary from completed surveys corroborated this notion: "I feel sufficiently consulted but I think our process can be improved"; and from a member of the SENIOR position category: "My involvement has been adequate – more economic analysis is needed".

4.9 Evaluation of Success of Implementation

4.9.1 Overall Measurement of Success

Respondents provided information regarding their perceptions of the success of the implementation of their given new and emerging technologies. The 'Measurement of

Success' section of the questionnaire asked respondents to indicate their level of agreement or disagreement with a number of statements, which pertained to the results of the HTA process. Figure 20 below summarizes the response profiles generated by survey replies. All replies (maximum fifty-three, i.e. the number of "Yes" [regarding new technology acquisition within the past five years] responses) are reflected in this graph.

As demonstrated in the graph, the largest proportions of responses indicating agreement with the given success measurement statements occurred with regard to the

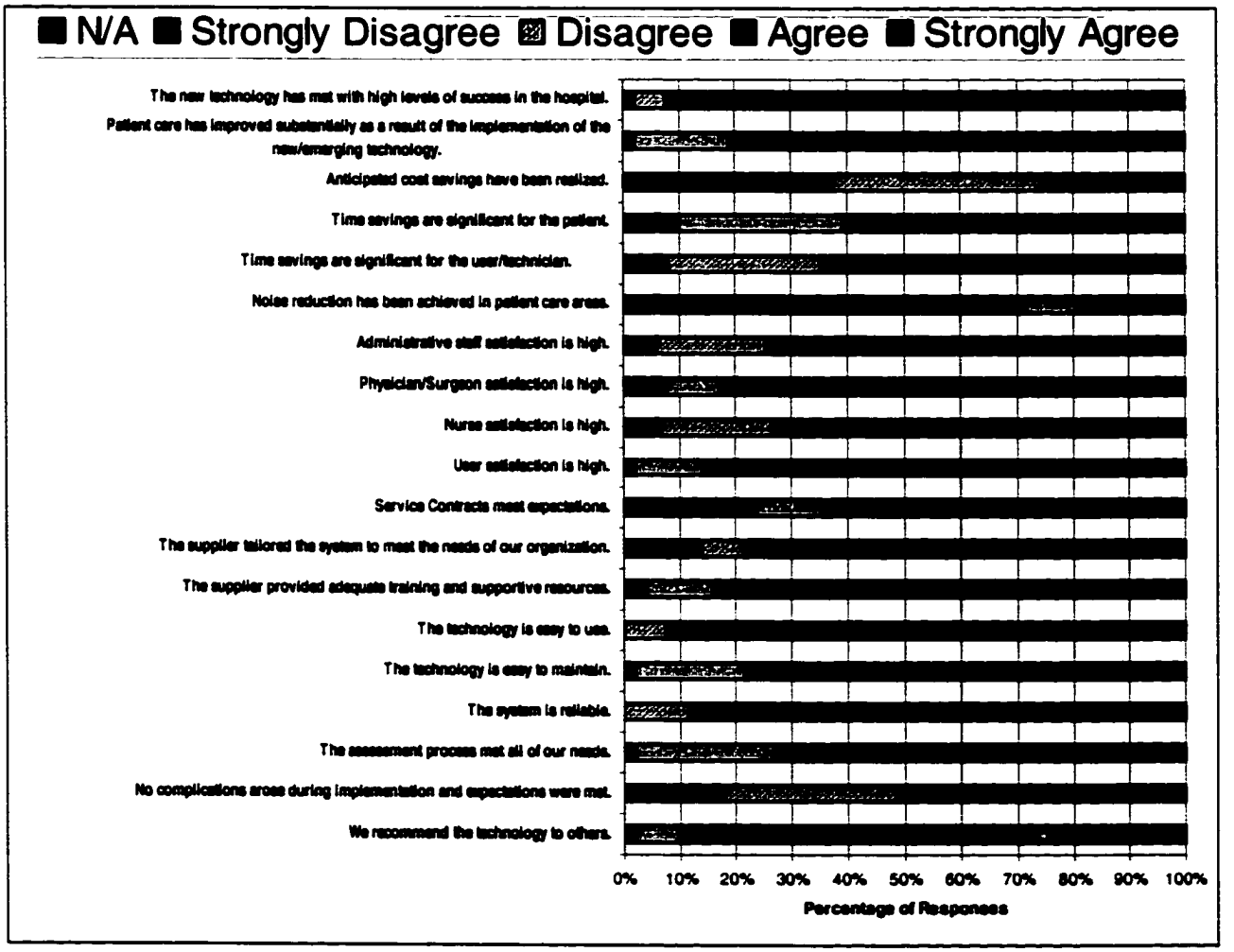


Figure 20. Response Profiles for Levels of Agreement with statements in the Measurements of Success section of the questionnaire. All survey responses are reflected. For any given statement, maximum possible sample size = 53 (number of "Yes" answers to question regarding acquisition of new/emerging technology within the past five years); minimum number of responses =45. See Table C44 in Appendix C.10 for associated tabular data.

following: overall success of the new technology (92.5% of respondents agreed or strongly agreed); improved patient care (81.1%); satisfaction on the parts of administrative staff (74.5%), technology users (85.7%), physicians/surgeons (82.7%), and nurses (73.3%); ease of use and maintenance of the technology (92.3% and 78.4% respectively); system customization by supplier (78.4%) and adequate provision of training by supplier (84.0%); reliability of the system (88.5%); and adequacy of the assessment process (72.5%). Finally, 90.2% of respondents either agreed or strongly agreed that they would recommend the technology to others. While these are positive results, it is must be noted that there did not exist complete compliance and/or satisfaction: e.g., in the case of the final aforementioned statement, while over ninety percent of respondents indicated that they would recommend the technology to others, still nearly ten percent said that they would not do so. Again, outcomes were mainly favorable: i.e. a high percentage of replies denoted agreement. However, analysis of only strong agreement circumstances versus simple agreement cases yields a different pattern: the four statements, which received the highest proportion of specifically strong agreement responses were the following: "Physician/Surgeon satisfaction is high" 50.0%); "The new technology has met with high levels of success in the hospital" (47.2% of all respondents specified strong agreement); The system is reliable" (44.2%); and "User satisfaction is high" (42.9%).

The greatest expression of disagreement occurred in instances surrounding financial issues and the comprehensiveness of the assessment protocol. More than half of all respondents (51.0%) reported that anticipated cost savings were not met. Nearly half (49.0%) of all replies indicated that complications arose during the implementation

process and/or that not all expectations were met. With regard to expressions of strong disagreement specifically, the two top categories were the same: 13.7% of all responses indicated strong disagreement with the "Anticipated cost savings were met" statement and 17.6% specified such sentiment with regard to the "No complications arose during the implementation and expectations were met" assertion.

On the subject of expectations surrounding costs, a significant number of responses (23.5%) designated this indicator to be non-applicable. The greatest non-applicability percentage of responses (61.5%) was attributed to noise reduction in patient care areas. Another issue, which was deemed irrelevant (by 17.6% of respondents) was satisfaction with service contracts. It was not surprising to note that a significant fraction of replies specified the insignificance of this matter since over a third of surveys had assigned low or low-middle level of importance to service agreements as an equipment consideration (see §4.5 Equipment Considerations section earlier in this chapter).

4.9.2 Deviations from Overall Response Profiles

Responses for the nineteen individual statements were examined in the cases of each of the different analysis categories: type of technology, type of facility, and position of respondent; associated data are presented in Tables C45 through C57 in Appendix C.10.2. As was the demonstrated case in previous subsections, response profiles varied for various components of the different analysis categories. Comparisons (expressed as percentage point disparities) between the total percentages 'in agreement' over the entire response set and percentages 'in agreement' for the specific given category component are provided. The disparity between the total percentages 'in disagreement' (for the entire response set as compared with the specific category item) is also presented. The

quantity of such data for comparison is extensive and will not be fully enumerated here. Instead, it is sufficient to present a few illustrative examples.

For example, in the case of the HIS technology type, there was less agreement (i.e. fewer 'agree' and 'strongly agree' responses relative to the overall response set profile) with regard to all of the following: significant time savings for patients and users/technicians and high satisfaction on the parts of physicians/surgeons and nurses. These disparities are consistent with the fact that the hospital information system category of technology does not involve direct patient care equipment usage and may not even involve the abovementioned medical personnel directly. Conversely, in the case of the DIRECT and MONITOR technologies, there was a greater relative amount of agreement (or at least a lesser relative amount of disagreement) regarding these issues.

The graphs in Figure 21 on the next page provide an overview of the response profiles by technology type and by position of respondent regarding the following: the belief that new technology has effected significant improvement in patient care; the realization of cost savings; the level of nurse satisfaction; and the assertion that all expectations were met and that no complications occurred during implementation. As mentioned previously, the quantity of tabulated comparison data is great and is not presented here. For a full synopsis of success indicator response profiles by various category components, the reader is directed to Appendix – C.10.2 Responses by Category (Tables C45 – C57).

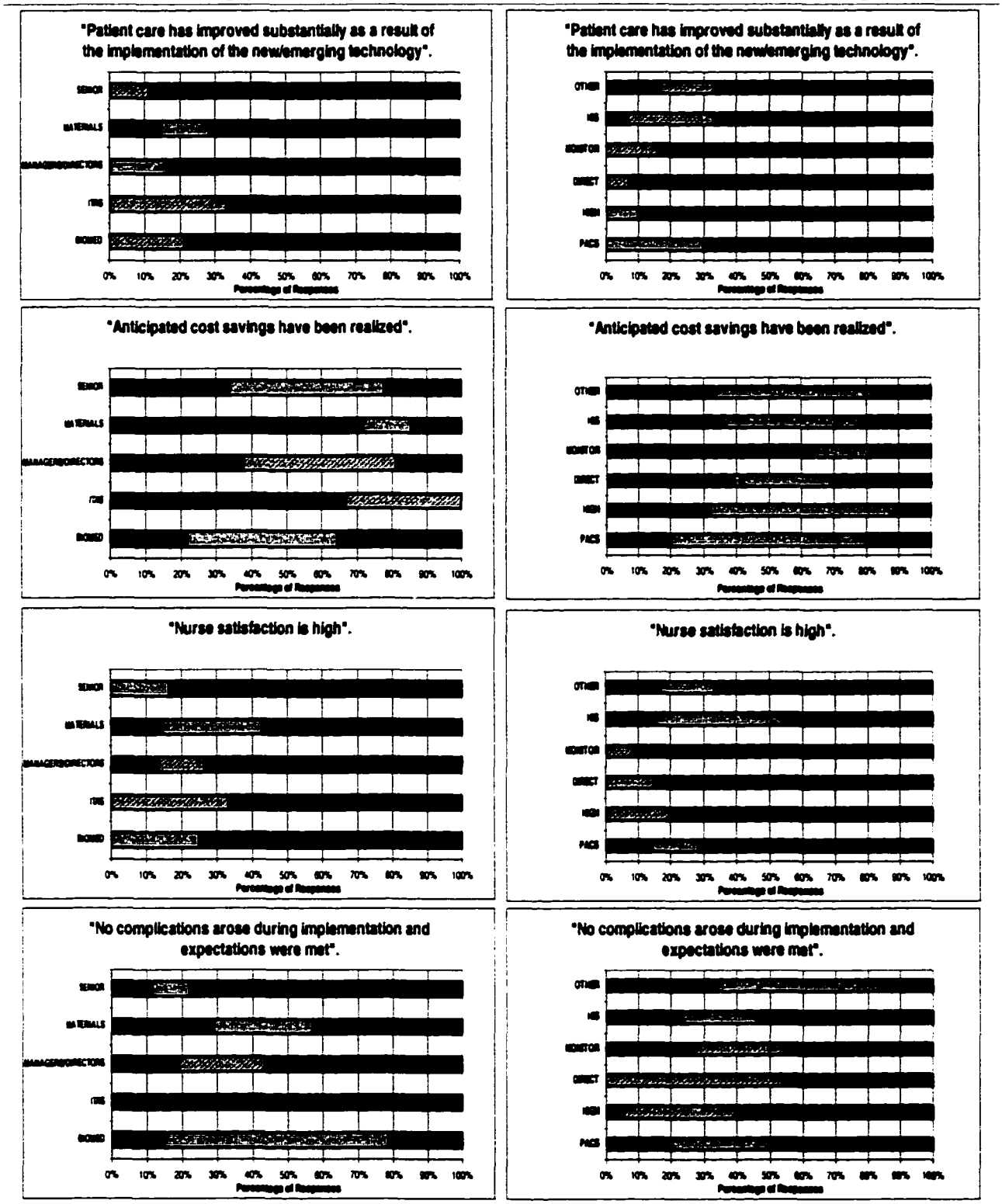


Figure 21. Responses Profiles for Selected statements grouped by Position of Respondent (in the case of the graphs in the left column) and by Technology Type (in the case of graphs in the right column). See Tables C45 – C57 in Appendix C.10.2 for data tables.

As stated previously, it may be that patient monitoring technology may have the most direct and immediate ability to impact patient care: respondents expressed the greatest amount (proportion) of strong agreement with the substantial improvement of patient care in the case of the MONITOR technology category. Also associated with this technology type was the greatest proportion of strong disagreement responses as regards the realization of anticipated cost savings. In the cases of three of the four statements (i.e. all but the statement regarding costs savings), relative to the other respondent position categories, SENIOR demonstrated the greatest amount of agreement (by means of proportion of 'agree' plus 'strongly agree' responses).

4.10 Patient Care Issues

Survey results revealed a possible inconsistency with regard to the importance placed upon patient care issues. Patients were regarded as a major concern and the improvement in the quality of care provided to them was viewed as a driving force for the acquisition of new technology. Yet, patients were not significantly involved in the assessment phases of healthcare technology evaluation.

Table 10 on the subsequent page summarizes the key aspects surrounding patients in HTA. The total number of responses included is fifty-two; this is the complete response set for "Yes" (regarding the initial survey question as to whether or not the hospital organization had purchased any new patient care equipment that could be considered new and emerging technology) replies (less the one survey, which had not been completed in entirety and did not address the 'potential to improve patient care' factor). "Not Yet" responses were not included, since, by definition, there would be no responses in the measurements of success sections. The second column (of six main

columns) in Table 10 summarizes the import attributed to the capability of the technology undergoing evaluation to improve patient care (as determined in the 'New and Emerging Technology – Process of Assessment/Implementation' section of the questionnaire, which requested information regarding the importance of various factors to the evaluation process of HTA). In a previous subsection of the 'Process of Assessment/Implementation' part of the survey, respondents provided an indication of the extent of involvement on the parts of a number of stakeholders. The third main column in the table summarizes these data. Finally, the penultimate and ultimate main columns provide a synopsis of the level of agreement with statements provided in the "New and Emerging Technology – Measurement of Success" section of the questionnaire: the statements assessed for the purposes of this analysis were "Patient care has improved substantially as a result of the implementation of the new/emerging technology" and "The assessment process met all of our needs".

Level of Importance/ Extent of Involvement	Potential to Improve Patient Care		Involvement of Patients as Stakeholders		Level of Agreement	"Patient Care has improved substantially..."		"The assessment process met all of our needs"	
	No.	%	No.	%		No.	%	No.	%
n/a	0	0.0%	11	21.2%					
Low	0	0.0%	16	30.8%	Strongly Disagree	1	1.9%	1	1.9%
Low-Middle	0	0.0%	8	15.4%	Disagree	8	15.4%	14	26.9%
Middle-High	6	11.5%	6	11.5%	Agree	22	42.3%	27	51.9%
High	46	88.5%	2	3.8%	Strongly Agree	21	40.4%	9	17.3%
no response	0	0.0%	9	17.3%	no response	0	0.0%	1	1.9%
TOTAL	52	100.0%	52	100.0%	TOTAL	52	100.0%	52	100.0%

Table 10. Summary of Patient Aspects in HTA evaluated in the questionnaire. Sample size = 52.

Nearly ninety percent (88.5%) of all respondents ascribed a high level of importance to the capability of new technology to effect an improvement in patient care. In fact, no replies ranked this factor as either low-middle or low level in terms of

importance. That is, one hundred percent of questionnaires indicated that patient care considerations were highly (middle-high [11.5% of responses] or high level [88.5% of responses]) important to the process of HTA. Notwithstanding, less than four percent (3.8%) of all respondents claimed that patient involvement in the process was to a high extent. In fact, only 15.3% of replies indicated a middle-high or high extent of participation on the part of patient stakeholders. So many organizations recognized the value of quality assurance in provision of care to patients, yet failed to involve the party, which they believed to be critical to hospital initiatives. Granted, one would not suggest that patient involvement in the selection of certain equipment types and operating systems or in the drafting of RFPs is requisite. What is at issue is not the non-applicability of patient involvement in certain instances of HTA. It may be taken as a given that patients need not – and in fact, cannot (on the basis of lack of expertise) – be involved in all technology acquisition projects. There were likely a small percentage of equipment acquisitions that required high patient participation; perhaps, the 3.8% of high extent of involvement responses reflect this. Again, the matter of concern is not that there were responses that indicated the non-applicability of patients to the process, but rather, that the proportion of such responses was not *higher*. It is admissible for patients to be considered irrelevant in particular healthcare technology deliberations and acquisitions; however, in instances where their participation is germane, the extent of their involvement should be higher (i.e. "high" or "middle-high", not predominantly "low" as was expressed by the questionnaire respondents).

Furthermore, only 40.4%[1] of respondents were able to strongly agree that the newly acquired technology had substantially improved patient care. The question is what happened to the remaining 48.1% (i.e. the difference between percentage of respondents indicating highest level of importance to the potential to improve patient care and the percentage of respondents specifying the highest level of agreement with the statement regarding the success of the implemented technology in improving patient care). In addition, only 17.6% of respondents specified strong agreement with the concept of the assessment process having met all of their hospitals' needs. On the basis of these responses, it is apparent that HTA processes were not entirely successful in terms of satisfying patient care requirements. This aspect of the process should be revisited; perhaps a plausible starting point for improving patient-focus initiatives could be to apply more focus on patients as stakeholders during the assessment process.

4.11 Suggestions for Improvement

The questionnaire sought information regarding individuals' opinions about potential means of ameliorating future technology assessment and acquisition processes. Specifically, it asked "If possible, what would you change and/or improve regarding the new/emerging technologies – a) the equipment itself; b) the assessment/acquisition; c) implementation (e.g. installation, training, etc.)?" A relatively small number of respondents indicated complete satisfaction with the technologies and associated equipment and processes that they had described in the survey. Thirteen equipment-related comments of a positive nature were received ("Equipment works well"; "The

[1] Note that this value is greater than that (39.6%) presented in the previous section, as a result of the larger sample size reflected in the previous section. Fifty-three replies were tabulated for that section, whereas fifty-two were included in this analysis.

equipment is very reliable"; "Equipment is excellent. We plan to continue to expand the number of machines to enhance our lab capabilities"; the reminder of the responses were simply "no" [in the sense of no changes necessary]). Three responses regarding the assessment process indicated no perceived need for change. Seven implementation-related responses implied no apparent requirements for improvement. The majority of responses included commentary regarding grievances and recommendations for improvement. Survey respondents raised a number of issues. Table A3 in Appendix A.4 presents a comprehensive list of comments made by respondents with regard to suggested improvements regarding specific aspects of the new/emerging technologies.

In addition, there was a sentiment among regional programs that it was difficult to coordinate technology acquisition among all sites (e.g. "...coordination is often difficult and/or results in less than optimal input from each site" – a comment from a facility, which constitutes one of nine regional sites; "The Region maintains too much control over equipment selection, acquisition, etc. This also involves too many people, is very bureaucratic"). However, some indicated their support of regionalization: "Makes sense to acquire on provincial level – lots of time spent assessing/site visits when several districts are looking for similar equipment" (from a hospital in Saskatchewan). The issue may be one of defining roles and responsibility: "Again, because of our 'regional' approach in Diagnostic Imaging, it is often unclear as to whether certain problems are the responsibility of the 'region' or the 'individual site'".

5. Conclusions and Recommendations

5.1 Conclusions

5.1.1 Adequacy of Planning

On the basis of the survey responses submitted, there is an apparent inadequacy in healthcare technology planning on the part of Canadian hospitals. The incidence of miscalculations with regard to training requirements, forecasted time required for installation, and the unanticipated need for renovations indicate an insufficiency in health technology preparations. Granted, during planning stages it is probably not feasible to account for *every* possible future implementation condition and circumstance. However, as affirmed by survey responses, the investment of more time in the health technology assessment and preparation processes and the application of more rigorous and comprehensive methods would minimize negative and unexpected results.

A question as to planners' comprehension of essential assessment and strategy parameters also arises. The reported low level of importance attributed to various factors for consideration in the HTA was unexpected. For example, across technology categories (i.e. independent of the type of technology under consideration), respondents indicated low interest in service agreements. Yet, for a given technology, often the expenditures related to service exceed capital disbursements.

5.1.2 Stakeholder Involvement

Increased stakeholder involvement is key. One survey respondent stated, "My wish is that all staff approach the acquisition of new medical technology from a collaborative perspective". Health technology is interdisciplinary; so, too, should be

Health Technology Assessment. In order to be effective, the research associated with HTA needs to be responsive to both professional and consumer needs. As such, "the involvement of consumers, people whose primary interest in health care is for their own health or the health of people they care for, is very important" (NCCHTA, 2002). As detailed in the discussion regarding Patient Care Issues (in §4.10), the issue is not with the deeming of certain stakeholders as inapplicable to particular technology assessments; rather, the concern is with stakeholders' level of involvement in cases in which their participation *is* deemed necessary. In these cases, the degree of participation should be 'high' or at least 'middle-high', not 'low-middle' or 'low'. If specific individuals are to be involved, why involve them minimally? Why not instead designate their contribution to be non-applicable.

> People seeking care want not only a cure, but a personal involvement in the process and systems for delivering care, whether curative or not. As decisions become more complex and difficult, decision-makers will increasingly need to involve stakeholders directly, not only in the evaluation process, but also in the decision-making itself, allowing ownership of these decisions to be more broadly based. (Battista and Hodge, 1999)

Decisions will indeed become more intricate as healthcare science advances. HTA strategies will need to allow greater levels of participation on the parts of various stakeholders.

5.1.3 The Value of New and Emerging Technology and the Importance of Improved HTA

Given that benefits – including increased quality in delivered care, improved patient and staff safety, quicker diagnosis, reduced incidence of error, and decreased length of stay (as reported by survey respondents) – arise from the adoption of new and emerging technology, it is important that these initiatives be executed. In order to promote the acquisition, or even the consideration of new and emerging health

technology, the HTA process requires refinement. It is not acceptable for there to be a fifty percent incidence of unforeseen cost encounters during technology implementation. This level of performance will not encourage new technology acquisition. Rather, it will detract from the effort. More comprehensive planning mechanisms are critical.

The incorporation of new and emerging technologies in health care facilities is important for two chief reasons. One addresses quality of care issues as well as the adherence of the nation's hospitals to global standards of new technology application. The other primary motive involves financial matters.

5.1.3.1 Quality of Care and Achievement of Standards in Health Technology Application

First, the Fraser Institute Report of 2000 indicated that Canada lagged the majority of the industrialized world with regard to high technology imaging (including CT, MRI, and nuclear medicine) (Shaw, 2000). In 2000, the president of the Canadian Association of Nuclear Medicine stated, "there are more MR scanners in the city of New Delhi than there are in all of Canada" (Shaw, 2000). Canada's per capita diagnostic technology capabilities rank among the lowest in the western world and are comparable with the status in underdeveloped countries (Zeidenberg, 2000). In addition, there is an aging and obsolescence issue: certain x-ray systems in parts of the nation are well over thirty years old, and "most medical imaging equipment is considered obsolete after twelve years" (Zeidenberg, 2000).

> High-tech equipment can diagnose medical problems at their earliest stages, when they can be most effectively treated. Long waiting periods often lead to a diminished quality of life and ultimately, to the loss of lives.
>
> (Zeidenberg, 2000).

According to the CEO of the Canadian Association of Radiologists, the availability of advanced technology to support quality patient care is critical: "If the diagnosis is inefficient, the treatment is going to be inefficient" (Zeidenberg, 2000).

Thus, the application of adequate assessment and acquisition processes for new healthcare technology in Canadian hospitals is indeed necessary.

5.1.3.2 Financial Factors

Healthcare costs continue to rise as time progresses. For example, British Columbia currently spends 41% of its provincial budget on healthcare funding; ten years ago, the corresponding percentage of budget allocation was 34% (Girard, 2002). An escalating problem in Canadian hospitals is the "mismatch between revenue and expenditure" (Brown, 2001). In Ontario alone, according to the Ontario Hospital Association (OHA), there is a requirement for an additional $990 million in funding for the province's hospitals over the next year (Frketich, 2002). Without additional funding, the OHA predicts the following losses: "laying-off 9,500 full-time staff; closing 2,500 hospital beds; admitting 79,000 fewer people; cutting 1 million outpatient visits" (Frketich, 2002). In addition, "Ontarians can expect more emergency room backlogs, longer waiting lists and more patient transfers to the United States unless the next provincial budget includes an extra $1 billion for hospitals" (Boyle, 2002). Again, new and emerging healthcare technologies produce significant benefits in health facilities. Since cost issues threaten to preclude the adoption of novel technologies, it is of utmost importance that new healthcare technology undergoing evaluation be extensively and critically analyzed. Processes must be instituted to better project funding, training, etc. requirements. According to a report of the "Future Needs for Medical Imaging in Health Care" Working Group commissioned by Industry Canada, "there is an urgent need to repair the results of years of under funding of capital investment and infrastructures in Canadian hospitals and clinics" and "the health-care system needs to develop budgetary

tools and financial systems which permit and facilitate cost-effective technological innovation" (Industry Canada: Medical Imaging Technology Roadmap Steering Committee, 2000). Health Technology Assessment systems aiding and allowing economic technological advance are also necessary.

5.1.4 Process Formalization

The field of healthcare technology planning requires renovation. To this end, a possible starting point is the formalization and standardization of this process. The recognition and acknowledgement of HTA as a vital component of hospitals' core business would promote an understanding of the tremendous power and importance of a well-executed healthcare technology evaluation and planning methodology. Hospital personnel need to gain an awareness of the magnitude of the current shortcomings resulting from the lack of adequate health technology assessment practices.

The application of consistent analysis tools and methodologies would permit increased HTA efficiency and uniform measures and standards by which to evaluate various technologies. A number of survey responses noted that no "centralized regional capacity for technology assessment" exists. One respondent indicated the following:

> Regrettably, however, neither the [Health Authority] nor the province has evolved a formal technology assessment program. Technical and clinical evaluations of competing products of the same type (e.g. patient monitors, anesthetic gas machines) are nearly always done prior to purchase but comprehensive assessment of competing technologies is done rarely.
>
> New and innovative technologies (e.g. Gamma Knife; BIS intra-operative monitoring; Ho:YAG lasers for TURP; telehealth with real time physiological data transmission couple with live video) are introduced based on the initiative of individuals who champion the need for the technology. It is very rare that comprehensive assessment of the impact of the technology, its benefits vs. cost or evaluation of alternatives is done.

Others echoed the lack of formal HTA processes and noted the value in investigating the possibility of performing hospital HTA at the provincial level: "Makes sense to acquire on provincial level – lots of time spent assessing/site visits when several districts are looking for similar equipment". Ideally, a formal national HTA program would allow for even greater efficiency and uniformity of hospital technology advancement endeavours.

5.2 Suggestions for Future Study

5.2.1 Additional Questionnaire Investigation

Further research into Canadian healthcare institutions' perceptions and practices regarding healthcare technology would be beneficial. In future, it will not be enough to simply consider the purely scientific aspects of the technologies in question – investigation of other facets will be necessary.

> Health technology assessment appears to have a bright future. However, this opportunity may be missed if an excessively scientific focus leads to technocratic irrelevance. Indeed, the assessments of the future will increasingly be expected to consider the social and ethical dimensions of the technology use.
>
> (Battista and Hodge, 1999).

Analysis of the questionnaire responses to the survey upon which this document is based (henceforth referred to as Version 1.0; see Appendix D.1 for a copy of this questionnaire) revealed a number of issues, which require revisiting. Version 1.0 asked respondents to comment on the following statement: "Patient care has improved substantially as a result of the implementation of the new/emerging technology"; a subsequent edition should seek to determine whether there were any instances of new and emerging technology producing a decrease in the quality of patient care. A key inquiry, which should be made in future questionnaire

adaptations, is the *nature* of unforeseen costs and other unanticipated circumstances; it would also be instructive to ascertain the monetary values and the chief reasons and impacts associated with such unpredicted conditions. Also of interest are the recourse paths taken.

Other issues to be investigated include the *reasons* for levels of involvement attributed to various stakeholders. Specifically, the physician participation issue requires probing. Nearly a quarter of all survey respondents indicated a need for greater physician involvement in the HTA process. Physician interest and demand were cited as driving factors for technology acquisition. This would indicate interest on the part of these stakeholders. The causes that lead to the difficulty in obtaining their participation need to be elucidated. The possibility exists, that while physicians are interested in healthcare technology, they do not have the time to take part in the assessment process.

Another important question to pose of survey recipients is whether or not they are aware of HTA resources (e.g. The Canadian Coordinating Office for Health Technology Assessment [CCOHTA]; see Appendix E – Resources). Moreover, it would be valuable to ascertain the frequency with which they avail themselves of these types of resources. Listing specific resources individually and inquiring as to their respective rates of usage may help to identify which HTA agencies and resources are most recognized and/or utile.

5.2.2 Focus on Specific Areas

The Information Technology and Information Systems aspects of health technology are of great importance. As it is imperative to probe these parts more deeply, there is a need for an HTA questionnaire similar to Version 1.0, but

targeted specifically to IT/IS. Perhaps this future IT-focused questionnaire should be sent from an IT professional to elicit a higher rate of response.

Future study into the position and involvement of senior management in HTA is important. There needs to be a determination as to whether or not senior management personnel in hospitals are at all dissociated from the results of technology implementation: is senior management fully informed of the negatives and/or unforeseen circumstances that arise in the implemented process?

With regard to Long-Term Health Care facilities, specific targeted questionnaires should be developed to further query their perception of technology. The Health Technology Assessment Programme of the National Coordinating Centre for Health Technology Assessment (NCCHTA) at the University of Southampton specifies health technologies to "include all interventions...to promote health, prevent and treat disease, and improve rehabilitation and long-term care" (NCCHTA, 2002). As technology is an all-encompassing term, it is interesting to note that the long-term care (LTC) facility respondents, as a group, did not recognize the presence of some sort of technology on their premises – no telephone systems, data management systems, patient lift technology, etc. A subsequent investigative method (e.g. future adaptation of the HTA questionnaire) should specifically mention such items and prompt discussion with LTC facilities.

5.2.3 Analysis of Suggestions Proposed by Survey Recipients

An in-depth examination of all of the textual commentary provided by survey respondents would be instructive and would reveal areas for additional

investigation. Discussions (perhaps by means of telephone conferences) with interested parties would also be beneficial. Several respondents expressed interest in future contact. An organization of interested parties could help to build the framework for the formalization of HTA in Canada.

5.2.4 Expansion of HTA Resources: Data Mart Application

The possibility of generating a national Data Mart level system for warehousing HTA data should be considered. A well-designed data warehouse would permit users to query the database on the basis of a combination of specified factors (e.g. type of technology, type of facility, geographic region [or province], stakeholders involved). The concept of developing a functional analytical tool (to complement and expand upon the capabilities offered by the current online reference libraries of research and assessment papers) warrants investigation. A survey of hospital personnel affiliated with technology assessment to ascertain their receptiveness toward, and desire for, such a system should be executed. The type of system proposed would allow users to easily (without need of programming experience) build their own dynamic analysis parameters and specify indicators. A user-friendly graphical user interface could be designed to serve as the front-end to this proposed powerful combination of data repository and analytical package.

5.2.5 Execution of a Commission on Health Care Technology in Canada

The Commission on the Future of Health Care in Canada, headed by Roy Romanow (former Premier of Saskatchewan) was scheduled from March 4, 2002 – May 16, 2002. The purpose of this project was to "make recommendations on

sustaining a publicly-funded health system that balances investments in prevention and health maintenance with those directed to care and treatment" (The Commission on the Future of Health Care in Canada, 2002). Romanow stated that, "The task before us is to draw upon the ingenuity of all Canadians to ensure . . . that our health system meets the challenges of the 21st century" (The Commission on the Future of Health Care in Canada, 2002). This Commission should have included healthcare technology assessment in its investigation. Since it did not involve such an exploration of Canadian practices, perceptions, and capabilities regarding HTA, a subsequent commission should be executed to evaluate this critical healthcare component.

5.3 In Closing

New and emerging medical technologies hold tremendous promise of contributing to the improvement of healthcare in Canada. It is likely that they can also alleviate certain monetary demands overwhelming the system. Despite this, there are major inadequacies in healthcare technology assessment. The Canadian hospital industry needs to realize the opportunities offered by new and emerging technologies and the benefits, which could result from adequate HTA processes. Considerations for the future are of paramount importance: as available technology advances in concert with the expansion of biomedical science, the methods of HTA will have to similarly evolve in complexity. The development of a solid and comprehensive assessment framework for evaluating healthcare technology is indispensable.

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Appendix A – Textual Commentary Provided in Survey Responses

A.1 Driving Factors Contributing to the Acquisition of New Technology

Technology Type	Driving Factors Cited by Survey Respondents in Response to the Question: "What driving factors contributed to the acquisition of this new technology?"
PACS	• Y2K compatibility of old Rad Info System • New technology is faster, more software options • Archiving problems; delays in diagnosis, length of stay, test-retaking; space storage • Archiving problems (searching files) • Active radiologist who travels to smaller hospitals; saving funds by becoming filmless • Efficiency • Research • Quality of image • Education (learners and post-grad students in medicine and other disciplines) • Access and turn around time to view and report • Need to provide diagnostic support to our clinicians and community • New clinical modalities • Desire to store all information digitally • Ongoing upgrading of medical technologies • Patient file maintenance with historical imaging/filing – there are often past exams lost or out to a specialist • Physician to physician consultation – both consult and GP can be reviewing exam remotely from each other • New facility and decision reached to build for future and not employ older technology
HIGH	• Aging/unreliable equipment • Offers expanded test menu • Improved patient care • Desire to be a leader in the application of new technologies • Patient demand • Clinical curiosity and desire to do what is best for patients and staff • Improved quality of imaging • Improved access for consultations • Improved processes – imaging, pharmacy distribution • Reduced waste (chemicals, film) • Workload on existing single slice Ct Scan • More diagnostic capability with new scan • Reduction of waiting list for patients • Developing and defining a leadership role in selected areas • Replace obsolete equipment • Requests from physicians for new technology • Administration's desire to move to new computer base solutions • Population need • Accessibility • Ability to provide continuum of care within a specific program • Improved diagnostic capability • Required to maintain referral center status • Physician interest/demand

Technology Type	Driving Factors Cited by Survey Respondents in Response to the Question: "What driving factors contributed to the acquisition of this new technology?"
DIRECT	• Encouragement of staff initiatives and professionalism • Mainly excess age of existing/available equipment; very few cases of development/new services • Clinical excellence • Specific surgery procedures changing; surgeons need to keep pace and move to new emerging technology • Patient needs, shorter hospital stay, improved outcomes • Replacement of old unserviceable equipment • Wish to reduce length of stay • Wish to be able to transmit images to/from tertiary centers • Need to avoid patient transfers to other centers, where possible • Ease of use • Reduced anesthesia • Quick recovery • Efficiency • Biphasic defibrillation technology new • Patient safety • Enhanced patient care • Requests from physicians for new technology • Age of existing equipment • Y2K issues
MONITOR	• Portability, flexibility and reduction of network connections • Old technology obsolete • Demands of practice require cardiac monitoring when none was required before • Replace old equipment • Expanded facility • Standardization of monitors • Additional monitoring features • Decrease cost long run • More effective and efficient • Previous system obsolete and increased caseload with cardiac issues and diagnosis • Patient demand • Need for better and more versatile patient monitoring especially of those who do not need to be confined to bed • Old equipment no longer having parts made (e.g. Lifepak 8) for repair • New technology with expanding capabilities such as modem connection • Many systems contained in one unit • Life cycle issues • Merging separate facilities • New options and efficiencies • Greater diagnostic capabilities • The department could not provide the full service as the present equipment was inadequate • Out of date (including Y2K issues) • Unable to service/replace worn parts • Patient safety with changing clinical standards • Better diagnosis capabilities

Technology Type	Driving Factors Cited by Survey Respondents in Response to the Question: "What driving factors contributed to the acquisition of this new technology?"
HIS	• Need to share information in a more concise manner with a multidisciplinary team • Improve communication with regard to patient care and provide more sharing of information to increase holistic treatment aspects • Improving quality of patient care through informed decision-making • Improving the patient experience through coordinated service delivery • Generating process improvements that will allow clinicians to devote more time to providing quality patient care • Positioning the hospital as an area hospital of choice by providing state-of-the-art information management tools • Reduce offsite storage costs • Paperless reports • Renewal of financial and human resources systems following the growth of the budgets of the establishment by the merger of hospital, long-term care, community services and rehabilitation centers • Standards based care delivery • Progress toward an electronic patient record and care/information accessibility across the continuum • Improve accuracy and efficiency • Telehealth initiative provides for communication between specialists and remote locations and allows remotely located hospital to obtain required services • Move towards electronic record which is not fragmented • Y2K • Need to streamline patient care • communication
OTHER	• Aging/obsolete existing equipment most of which cannot be repaired due to replacement parts which are no longer made by company • Security needs • Needs analysis • Life cycle management • Short and long range planning • Changing needs of clients and staff and changes in policy • Desire to do what is best for patients and staff • New hospital opening • Aging/obsolete equipment no longer serviceable

Table A1. Driving Factors for New Technology Acquisition by Technology Type. Direct quotes from the collection of survey responses. These are the replies provided in response to the question "What driving factors contributed to the acquisition of this new technology?" which occurred on the first page of the questionnaire.

A.2 The Value of New Technology

The following table summarizes respondents' perceptions of the results generated by the incorporation of new technology in their facilities.

Technology Type	Outcomes of New Technology Implementation
PACS	• Expanded imaging test menu • Increased speed • Fewer errors • Radiologist can see the image of a patient far away and make decision if patient needs to be transported or not • Real-time display, better resolution, better access • The better diagnosis and treatment of disease
HIGH	• Speed and accuracy • Improved quality of images. Improved detection of pathology • Changes the mode of operation, provides more precise and more reliable data, permits good transmission of data, but does not necessarily generate cost savings • We are able to provide more accurate test results • (regarding a given program, the only one of its kind in Canada) It helps us define our areas of excellence • Better quality x-ray image • Greater throughput. Better able to deal with accelerator downtime • Modern ESU's provide clearer/safer operation • Increased access, decreased travel for patients • Overall patient care is improved • Primary difference is earlier diagnosis → earlier treatment
DIRECT	• Lower energy from defibrillators provides less harm to patients • Shorter hospital stay, patient outcome & satisfaction. Less O.R> time, direct patient outcome improved • Smooth, un-interrupted flow of patients – better consultation with tertiary facilities; reduction in number of patients having to be transferred elsewhere for care or consultation • Quick access to lab testing for patients. Results are accessible within 5-15 minutes and appropriate treatment can be implemented. Physicians are extremely pleased with quick accurate results and nurses are pleased too because quick access to timely reports assists with the prevention of back up in the Emergency department. • More accurate diagnosis capabilities • Overall patient care is improved
MONITOR	• Safer patient care – safer work conditions for staff in some situations • More reliable technology • Ease of care and increased safety of staff • Provide coherent patient care • Providing one-stop service • Operations on patients will be safer. This is the best technology available. • Better diagnosis and monitoring of patients.
HIS	• Records is available 7x24 • Helping to become paperless • More complete and comprehensive documentation • Improve accessibility to service • Better client care and services
OTHER	• Increased safety, better patient care and services

Table A2. Direct Quote Response Commentary to the following survey query: "Do you notice a difference in patient care pre- versus post-incorporation of new and emerging technologies in your particular hospital environment? What is the greatest contribution these technologies have made?" Responses grouped by Technology Type.

A.3 Unforeseen Circumstances Encountered during the Implementation Phase

The following comments (which are directly quoted, but in no particular order) were provided in response to the "Please comment" request in the Implementation of New and Emerging Technology – Unforeseen Circumstances component of the questionnaire.

- staff very reluctant to take on new technology; only see negatives rather than positives of change; staff quick to identify barriers rather than working toward resolution
- additional power required, room modifications and signage required. Laser safety committee was required to be formed
- vendors do a poor job of covering off everything needed. A turn-key solution may be more expensive from the start but may be less costly when hospital staff time for working the bugs out is calculated in
- planning and overview of a project that's not one of the institution's focuses; short term management, no long-term vision
- only one – "Free PSA" was held up by BC labour negotiations disputes – now over
- getting physicians and nursing to accept security system has been stressful
- generally deficiencies and other associated costs that were not anticipated in any project or major equipment purchase
- physician's buy-in
- on the PACS, it wasn't any of the factors above, it was more unreliability of system, constant upgrades and inability to meet the expansion expectations
- even if there is conformity to the submission, the supplier always justifies additional costs. Have to better describe our needs and most importantly our expectations
- users requested changes to their work area after installation
- Training was more difficult than anticipated
- Increase education (with regard to staffing and training)
- Changes in nursing staff provide need for constant training and orientation
- A couple of minor changes were required after all other renovations had been planned for
- Difficulty in training MDs on use/not on staff of hospital so zero attended sessions offered; had to be trained by ER staff when using equipment

- Most emerging medical technologies require significant amount of additional effort during early stages. Hospital staff and even vendors sometimes unsure how best to handle implementation
- Everything was dealt with upfront before purchase. Depending 5 or 6 departments should sign off then there should be no surprises
- New computers need changes to working spaces
- Problems encountered were minimal and being corrected by local professional staff. Some minor purchases and travel were required
- Better planning would allow for a minimum of unforeseen circumstances
- Phased in implementation
- The requirements went to five machines instead of one originally
- Renovations: needed more air conditioners to accommodate cooling of equipment; projected installation inaccurately related to age of building and unexpected maintenance issue despite prior consults with district engineers
- MRI film and storage media requirements underestimated
- There were unforeseen circumstances, however, were minimized due to the time taken in the planning stages

A.4 Suggested Improvements Regarding Specific Aspects of the New/Emerging Technologies

Aspect of New Technology	Suggested Improvements
Equipment	• Promises and/or contract penalties to ensure equipment performance • New technology equipment should address a need and simplify the process, not cause additional problems, costs and resources • Yes, if more funds had been available we would have made another choice • Enhancements to the product to keep current compatibility/integration with existing products • Hospitals need to have access to new technology, however, budgets do not follow and supplier maintenance contracts are too burdensome • Technology is changing at such a rapid pace that by the time it is purchased, it is already outdated • Ask companies to try to make sure that new technologies are designed and built for operation in the real world of the hospital. Consider human factors issues more fully. • Software is always frustrating • Use of more digital (some needs to be developed) clinical equipment • Less traumatizing for patients • Cost • IT interfaces still too complicated and diverse – decrease to costs! • Employ outside consultants to assist in selection process
Assessment and Acquisition Processes	• Need more work on actual physical plant modifications. More involvement by supplier prior to presenting full program to users. • Net Present Value calculations of all offerings, technology assessments and RFP done by cross functional teams of clinical and technology staff, planned obsolescence and replacement planning from the beginning of any project. • Speed up approval process • Too time consuming to get approvals and acquire equipment/vendor selection • Process should take less time • Have more physician involvement – would need to then pay them to participate more • Process was fine, enough FUNDS were not • Consider installation more clearly and try to anticipate unforeseen expenses • It is necessary to greatly increase the involvement of the users (technicians) and to obtain he comments/opinions of the medical body • More info up-front. • Streamline and speed it up • Research was done thoroughly, acquisition was hurried and a higher cost resulted • Physio control VERY tardy in getting equipment and quotes on site; long wait for equipment; low availability to site • Too long • Ensure that all the players involved in this process are working together smoothly and effectively • Yes – more economic analyses

Aspect of New Technology	Suggested Improvements
(Assessment and Acquisition Processes – continued)	• There is still too much bureaucracy. We need to be funded and then let the professionals do our jobs. Long drawn-out meeting with a multitude of participants are a waste of resources. • More involvement of the body of medical personnel from the beginning of the acquisition process • Yes – more planning and effective assessment method • Increased engineering involvement – scientific evaluation • Always dynamic: revise as needed to maximize efficiency • Employ outside consultants to assist in selection process • The process took a year as needs assessment changed • Extremely long to reach consensus/consult all parties involved/across professions/campuses, etc. • Makes sense to acquire on provincial level – lots of time spent assessing/site visits when several districts are looking for similar equipment • Continue with the multi-disciplinary process
Implementation	• Cooperation and understanding from staff when equipment transitions are taking place • Training should be included after installation and should reflect all operational requirements • Training – need more trainers • Turn key installations with incentives / penalties for meeting or exceeding implementation dates • Training to be done closer to implementation date • Allotted budgets are sharply insufficient. It would be necessary to allot more time to training and to take the time to become well acclimatized to the new technology before rendering it completely functional • More training • Training rep difficult to find to get on site; cancelled twice before coming finally on the day booked! • Stress the importance of detailed 'hands-on' training. It is not enough for staff to watch a sales rep operate a device. They need direct experience themselves before patient use. • Make sure training coincides well with implementation • Some vendors are great, others are somewhat less so... • The suppliers lack expertise regarding the installation part and for adaptation to the premises • Stay organized • Have lots of human resources for training - ? replacement of workers • Addressing the gap between installation of new equipment and maintaining old equipment in order to maintain services • More streamlined • Extremely difficult to keep scope of projects under control • Provide on site education • Continue to refine the process

Table A3. Suggestions for Change and Improvement in New and Emerging Technology Assessment and Implementation. Direct quotes from the collection of survey responses. These are the replies provided in response to the question "If possible, what would you change and/or improve regarding the new/emerging technologies – a) the equipment itself? b) the assessment/acquisition process? c) implementation (e.g. installation, training, etc.)?"

Appendix B – Analysis Categories

B.1 Type of Technology

The following table encompasses all of the types of technology and their associated equipment described in the entire collection of questionnaire responses.

Technology Category	Technology and/or Equipment
PACS	• Picture Archiving and Communications Systems (PACS) • Radiology Information System (RIS)
HIGH	• AgFa Medical Gateway Laser Imaging • Angio X-Ray - Philips • Computed Radiography and Tomography (CR and CT) – scanner, simulator • Digital Medical Imaging • Gamma Camera • Image-Guided Neurosurgery – Stealth Station • Infant Cranioplasty – headbands • Interventional and Intraoperative Magnetic Resonance Imaging • Linear Accelerator • Magnetic Resonance Imaging (MRI) - Philips - Zonits • Mobile MRI - GE Mobile Unit • Multi-leaf Collimators (MLCs) • Multi-slice CT - with All Virtual Modalities - General Electric - Toshiba • Nuclear Medicine Camera • Numerical Fluoroscopic Imaging • Positron Emission Tomography (PET) • Robotic Technology for Molecular Genetics – Robotic Workstation • TeleRadiology/CT Scan • Tomodensitymeter (TACC) • Voice-Activated OR Control Systems – HERMES System
DIRECT	• Defibrillators • Digital Cardiac Angiography • Electronic ECG management with tie into ICU monitors - 12-lead ECG electronic capture from ECG carts & ICU monitors • Endoscopic Ultrasound • Electrosurgical Units (ESU's) with Spny technology • "Free" PSA Testing • Holmium laser with Morcellator • HP Biphasic Defibrillator • Infant Incubator • Infusion Pumps • JUT surgery (incontinence; urology/obstetrics/gynecology)

Technology Category	Technology and/or Equipment

(DIRECT continued)	• Lithotripsy
	  - Lithotriptor
	• Microwave Endometrial Ablation (MEA)
	  - type of laser
	  - Microsulis MEA System
	• Photophosphoresis Therapy – Extracorporeal photophosphoresis
	• Point of Care (POC) Lab Testing – glucometry, heamatology, chemistry
	• Scopes – Colonoscope, Endoscope
	• Stereotactic Surgery
	• Surgical Instruments
	• Surgical Laser
	• Thermometers
	• Ultrasound
	• Urology Laser
	• Video Endoscopy

MONITOR	• Advanced Gas Passing Anesthetic Machine • Anesthesia Machines • Cardiac Monitors • Cardiac Monitors Network - Telemetry • Cardiac Monitor Systems by Siemens • Emergency Physiological Monitoring Systems • ER Monitors - Agilent • Evoked Potential Monitoring • Fetal Monitors • Lifepak 12 Cardiac Monitor/Defibrillator • Patient Monitoring • Patient Telemetry Equipment • Physio Control and Cardiac Monitor • Wireless Monitoring System in Emergency, Acute, Resuscitation, Observation, GI and Medical Day Care • Vital Signs Monitors
HIS (Hospital Information Systems)	• Community Net • Decision Support – CIHI data, fiscal data • Dialysis Consultations Teleconferencing Systems • Document Management • Electronic Patient Folder – HBOC McKesson • Electronic Patient Record • Electronic Software • Financial Systems • Human Resources Software • Informatics Upgrade • Integrated H.I.S. • Inventory System • IT Networks (decision support information, quality indicator data, fiscal information, management information, scientific journals, physician offices, research information online) • Lab Computerization • Laser Arch (software program) • Meditech • Order Entry/Result Reporting System • Patient Records on IS/IT • Pyxis Automated Pharmacy Dispensing Systems • Radiotherapy Treatment Management Systems (Varis) • Telehealth • Videoconferencing

Technology Category	Technology and/or Equipment
OTHER	• Air Handling Unit Control System – Computer-based System allows Monitoring and Adjustment from Central Location • Card Lock Security • Dictation System • Digital Dictation System over the Network • Door Control System – Electronically Controlled Door System Operated from Central Location • I.D. Card Access to Restricted Areas • Infectious Control Room with Infectious and Protective Modes – Self-Contained Ventilation System with Environmental Controls and Filtering System • Newer Electric Beds • Nurse Call Systems - Dukane Procare 6000 • Overhead Patient Lifting System throughout Facility • Patient Wander Guard – EXI • Personal Protective Alarm System – experimental system; Staff Location in Event of Emergencies • Soiled Linen Collection and Transfer • Sterilizer • Tracking Board

Table B1. Detailed Listing, by Type of Technology Category, of all of the technologies and associated equipment described in the set of questionnaire responses. The number of bulleted items in each category is not indicative of the absolute number of survey responses belonging to each category. It does correspond to the number of distinct items comprising each category. However, in some cases, there are multiple survey responses associated with a single item. For example, a number of different surveys described PACS and/or RIS systems, but PACS and RIS are each listed once in the PACS Technology Category.

B.2 Position of Respondent

The following table summarizes all of the different types of positions indicated in the entire collection of questionnaire responses.

Position Category	Occupations Included in Category
BIOMED	• Biomedical Engineers • Biomedical Engineering Managers • Clinical Engineers • Consultant to the President related to Strategic and Technological Directions • Director of Biomed and Equipment Planner • Director of Clinical/Biomedical Engineering • Director of Engineering • Director Health Sciences Technology • Director, Medical Engineering • Engineering Services • Manager of Biomedical Services/Technical Maintenance
IT/IS	• CIO • Director of Information Systems & Telecommunications • Information Systems Administrators
MATERIALS	• Chief Facilities Management & Engineering • Chief, Facilities and Material Management • Clinical Supply and Equipment Co-ordinator • Co-ordinator Purchasing • Director of Material Management • Manager of Material Resources and Technical Services • Senior Buyer
MANAGERS/DIRECTORS	• Accreditation Coordinator • Administrative Director – Diagnostic imaging • Assistant General Manager • Director of Administrative & Support Services • Director of Administrative Departments • Director of Client Services • Director of Maintenance • Director of Nursing • Director of Surgery • Head of Physics • Leader of Program Support • Medical Director • Middle Management • RHA Director of Diagnostic Services • Senior Manager Patient Care • VP, Clinical Support Services • VP's, Patient Services
SENIOR	• Associate Executive Director • CEO's • Executive Director • VP

Table B2. Listing of Survey Respondent Position, by Position Category, of all job descriptions provided in the set of questionnaire responses. The number of bulleted items in each category indicates the absolute number of distinct positions comprising each category.

Appendix C – Survey Response Details and Data Analysis Data Tables

C.1 Responses

A total of 112 responses were received. The details of these follow in the next subsections.

	English Only	Bilingual	TOTAL
Electronic Mail	18	3	21
Conventional Mail	73	18	91
Electronic + Conventional Mail	**91**	**21**	**112**

Table C1. Number of Survey Responses Received by Language Category and Dissemination Method

C.1.1 Nature of Respondents' Replies to the Inquiry Regarding the Acquisition of New Technology

The questionnaire asked whether or not the given facility had adopted any new and emerging technology within the past five years. The following tables and graphs demonstrate the response profile according to different parameters: type of facility, number of beds contained in facility, and the provincial location of the facility. In cases where there was no response to this question, the response is counted as a 'nothing' reply.

C.1.2 Type of Facility

	Community	Teaching	Cancer Centre	Chronic Care/ Long-Term Care	Psychiatric/ Rehabilitation	Regional	Unspecified	TOTAL
Yes	30	20	0	0	0	1	2	**53**
No	12	3	0	8	2	0	10	**35**
Not Yet	3	0	0	0	0	0	0	**3**
No response	0	0	1	10	5	3	2	**21**
Total	**45**	**23**	**1**	**18**	**7**	**4**	**14**	**112**

Table C2. Response Profile Regarding Recent Acquisition of New Technology. By Type of Facility.

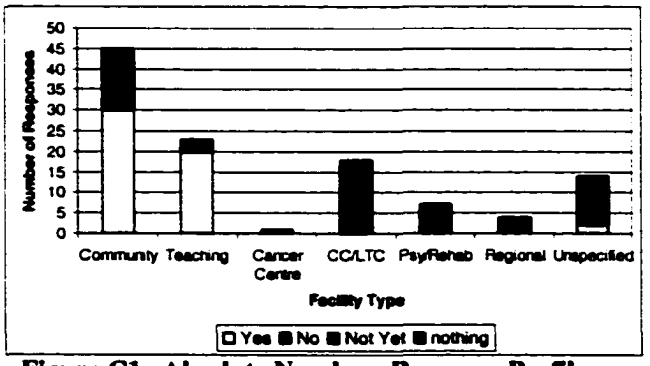


Figure C1. Absolute Numbers Response Profile: Recent Acquisition of New Technology by Facility Type.

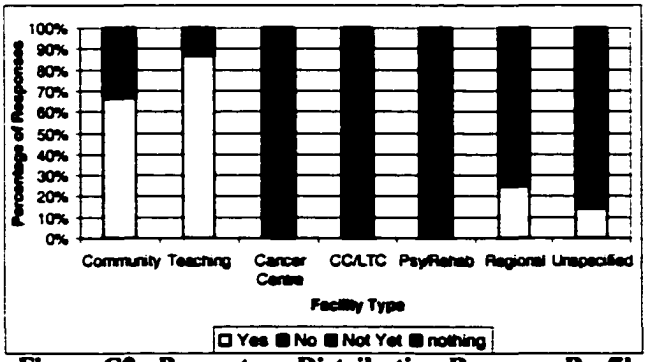


Figure C2. Percentage Distribution Response Profile: Recent Acquisition of New Technology by Facility Type.

C.1.3 Number of Beds in Facility

	0	<100	100-250	>250	Unspecified	TOTAL
Yes	0	16	14	20	3	**53**
No	0	12	6	5	12	**35**
Not Yet	0	0	3	0	0	**3**
No response	1	0	0	0	20	**21**
Total	**1**	**28**	**23**	**25**	**35**	**112**

Table C3. Response Profile Regarding Recent Acquisition of New Technology. By Facility Size (Number of Beds).

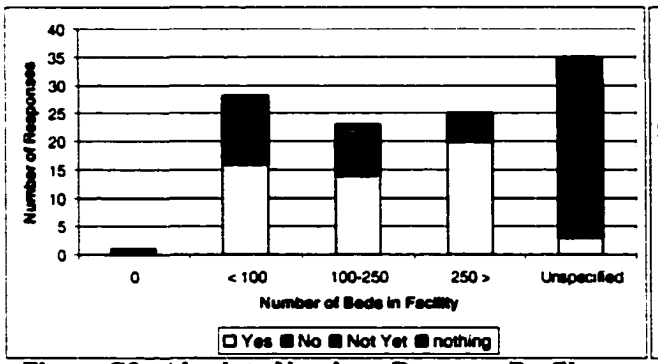


Figure C3. Absolute Numbers Response Profile: Recent Acquisition of New Technology by Facility Size (Number of Beds).

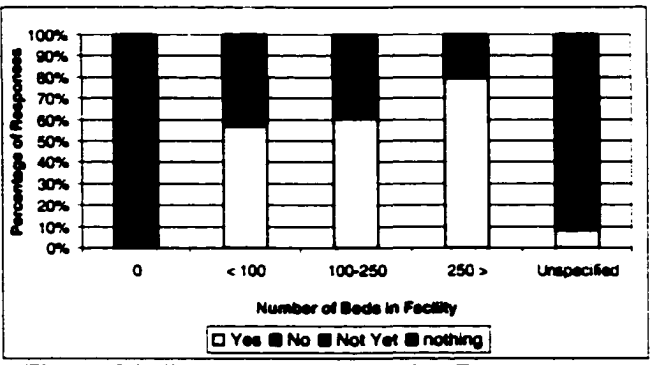


Figure C4. Percentage Distribution Response Profile: Acquisition of New Technology by Facility Size (Number of Beds).

C.1.4 Province

	AB	BC	MB	NB	NF	NS	NT	ON	PE	QC	SK	YT	Total
Yes	5	5	4	1	2	1	0	20	2	8	5	0	**53**
No	4	7	0	0	0	2	0	11	0	9	1	1	**35**
Not Yet	0	1	0	0	0	0	0	2	0	0	0	0	**3**
No response	4	0	3	0	0	0	0	6	0	8	0	0	**21**
Total	**13**	**13**	**7**	**1**	**2**	**3**	**0**	**39**	**2**	**25**	**6**	**1**	**112**

Table C4. Responses Profile Regarding Recent Acquisition of New Technology. By Location (Province).

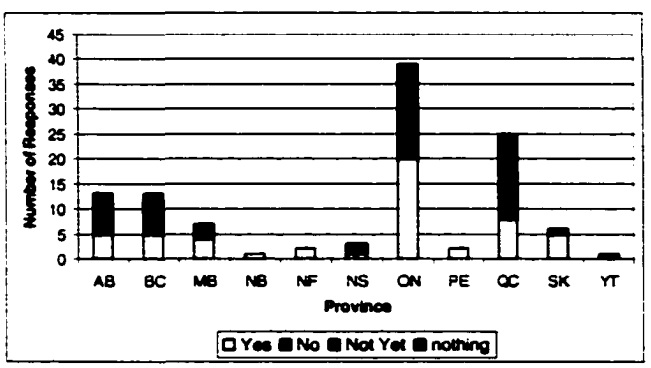


Figure C5. Absolute Numbers Response Profile: Recent Acquisition of New Technology by Location (Province).

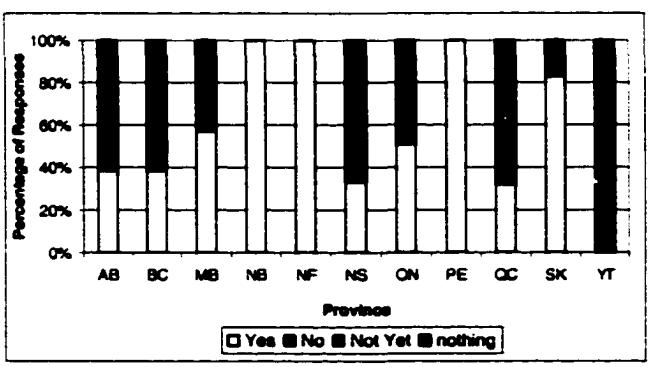


Figure C6. Percentage Distribution Response Profile: Acquisition of New Technology by Location (Province).

C.2 Individual Facilities Represented

Due to the receipt of 20 responses for which the facility represented was not unique, the 112 responses (detailed above) represent a total of 102 individual facilities. That is, two responses per facility were received from each of 10 particular facilities surveyed.

C.2.1 Duplicate Responses

The table below details the composition of the duplicate respondent group's replies to the inquiry pertaining to the acquisition of new technology.

YES/YES	4	
YES/NO	3	
NO/NO	3	
	10	facilities

Table C5. Duplicate Response Group's Response Profile Regarding Recent Acquisition of New Technology. E.g. there were four facilities for which all eight replies specified "Yes".

In the cases of the four facilities for which both respondents replied "Yes", the positions of the respondents were as follows:

Director of Surgery	Middle Management
CIO	Co-ordinator of Purchasing
Biomedical Engineer	Assistant General Manager
Engineering Services	Leader of Program Support

For the instances in which one respondent claimed that the facility had purchased new and emerging technology within the past five years, while the other replied "No", the positions of the respondents were as follows:

Director of Material Management	unknown
Director of Administrative Departments	unknown
Clinical Supply and Equipment Co-ordinator	unknown

The identity of the "No" respondents remains unknown as the questionnaire simply asked participants to return the uncompleted survey in the event that they had provided a "No" response to the initial technology question.

C.2.2 Number of Individual Facilities Represented

C.2.2.1 Facility Type

The facility type is based upon the classification information provided in the questionnaire responses.

	Number of Responses	Duplicates	Number of Facilities
Cancer Centre	1	0	1
Community	45	5	40
Chronic Care/Long-Term Care	18	2	16
Psychiatric/Rehabilitation	7	0	7
Regional	4	0	4
Teaching	23	3	20
Unspecified	14	0	14
Total	**112**	**10**	**102**

Table C6. Number of Responses and Number of Facilities by Facility Type.

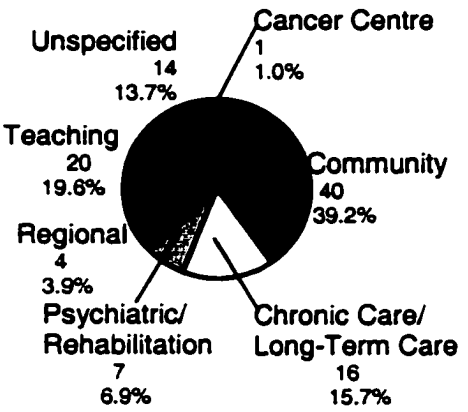


Figure C7. Number of Individual Facility Responses by Facility Type.

C.2.2.2 Number of Beds in Facility

The number of beds per facility is based upon the information provided in the submitted questionnaires.

	Number of Responses	Duplicates	Number of Facilities
0	1	0	1
<100	28	4	24
100-250	23	1	22
>250	25	4	21
Unspecified	35	1	34
Total	**112**	**10**	**102**

Table C7. Number of Responses and Number of Facilities by Facility Size.

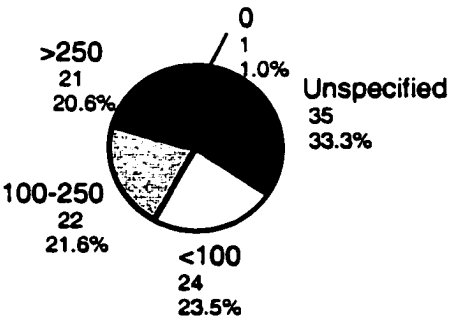


Figure C8. Number of Individual Facility Responses by Facility Size (Number of Beds).

C.2.3 Response Rate

C.2.3.1 Summary

	Distribution			Responses (Individual Facilities) [Duplicates not counted]			Response Rate		
	English Only	Bilingual	TOTAL	English Only	Bilingual	TOTAL	English Only	Bilingual	TOTAL
Conventional Mail	290	120	410	65	16	81	22.4%	13.3%	**19.8%**
Electronic Mail	135	31	166	18	3	21	13.3%	9.7%	**12.7%**
Total	**425**	**151**	**576**	**83**	**19**	**102**	**19.5%**	**12.6%**	**17.7%**

Table C8. Summary of Survey Response Rate by Language Category and Dissemination Method. Note that these data are based upon an assumption that all 576 survey request distributions were successful.

C.2.3.2 Response Rate by Province

	Number of Responses	Duplicates	Number of Facilities	Number of Requests	Response Rate
AB	13	1	12	66	18.2%
BC	13	1	12	80	15.0%
MB	7	0	7	21	33.3%
NB	1	0	1	11	9.1%
NF	2	0	2	23	8.7%
NS	3	1	2	14	14.3%
NT	0	0	0	1	0.0%
ON	39	5	34	190	17.9%
PE	2	0	2	5	40.0%
QC	25	2	23	145	15.9%
SK	6	0	6	19	31.6%
YT	1	0	1	1	100%
	112	**10**	**102**	**576**	**17.7%**

Table C9. Survey Response Rate by Province.

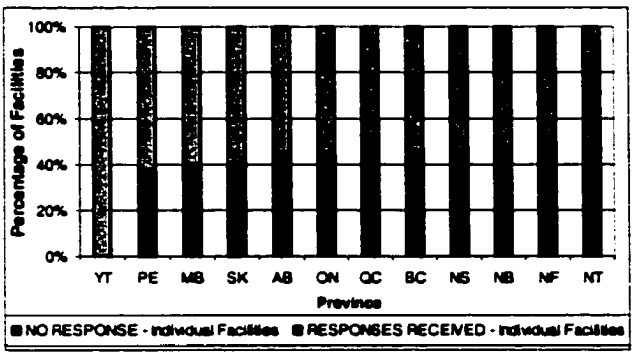


Figure C9. Survey Response Rate by Province (on an individual facility basis).

C.3 Timeframe

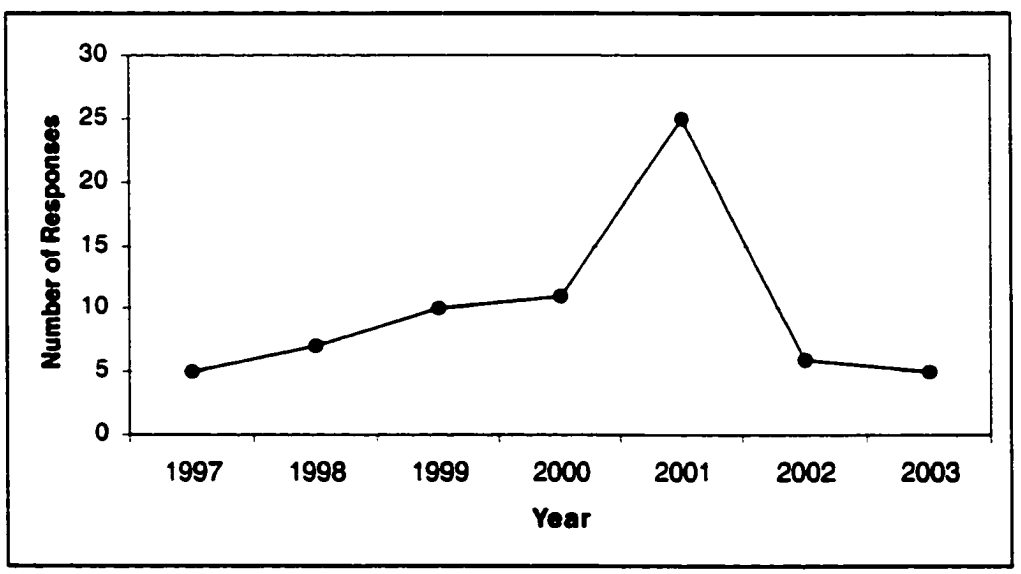


Figure C10. Number of New Technology Projects per Year as given by survey responses.

C.4 Stakeholder Involvement

C.4.1 Responses by Type of Technology

C.4.1.1 PACS

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	9	0.0%	11.1%	11.1%	11.1%	77.8%	88.9%	0.0%
Technology Officers (Equipment Users)	11	9.1%	0.0%	9.1%	63.6%	18.2%	81.8%	9.1%
Manufacturers	9	0.0%	22.2%	22.2%	44.4%	33.3%	77.8%	0.0%
Management: Operational	8	25.0%	0.0%	25.0%	37.5%	37.5%	75.0%	0.0%
Physicians	11	0.0%	0.0%	0.0%	36.4%	54.5%	90.9%	9.1%
Management: Senior	9	11.1%	22.2%	33.3%	33.3%	33.3%	66.7%	0.0%
Nurses	8	0.0%	0.0%	0.0%	37.5%	37.5%	75.0%	25.0%
Information Technologists	10	0.0%	0.0%	0.0%	80.0%	20.0%	100.0%	0.0%
Support Services	9	0.0%	22.2%	22.2%	44.4%	11.1%	55.6%	22.2%
Lab	8	12.5%	12.5%	25.0%	37.5%	12.5%	50.0%	25.0%
Allied Health	8	25.0%	12.5%	37.5%	12.5%	50.0%	62.5%	0.0%
Board of Directors	8	37.5%	37.5%	75.0%	12.5%	0.0%	12.5%	12.5%
Patients	8	25.0%	37.5%	62.5%	0.0%	12.5%	12.5%	25.0%
Community	8	50.0%	25.0%	75.0%	12.5%	0.0%	12.5%	12.5%

Table C10. Extent of Stakeholder Involvement Responses associated with the PACS Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.1.2 HIGH

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	19	0.0%	15.8%	15.8%	15.8%	63.2%	78.9%	5.3%
Technology Officers (Equipment Users)	20	0.0%	5.0%	5.0%	50.0%	35.0%	85.0%	10.0%
Manufacturers	20	0.0%	10.0%	10.0%	50.0%	35.0%	85.0%	5.0%
Management: Operational	19	10.5%	5.3%	15.8%	26.3%	57.9%	84.2%	0.0%
Physicians	21	0.0%	14.3%	14.3%	23.8%	61.9%	85.7%	0.0%
Management: Senior	19	5.3%	15.8%	21.1%	15.8%	63.2%	78.9%	0.0%
Nurses	19	10.5%	21.1%	31.6%	47.4%	21.1%	68.4%	0.0%
Information Technologists	21	9.5%	14.3%	23.8%	52.4%	23.8%	76.2%	0.0%
Support Services	20	5.0%	30.0%	35.0%	50.0%	15.0%	65.0%	0.0%
Lab	19	15.8%	15.8%	31.6%	36.8%	21.1%	57.9%	10.5%
Allied Health	18	11.1%	27.8%	38.9%	33.3%	27.8%	61.1%	0.0%
Board of Directors	19	15.8%	26.3%	42.1%	21.1%	26.3%	47.4%	10.5%
Patients	19	36.8%	31.6%	68.4%	21.1%	0.0%	21.1%	10.5%
Community	19	26.3%	26.3%	52.6%	31.6%	0.0%	31.6%	15.8%

Table C11. Extent of Stakeholder Involvement Responses associated with the HIGH Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.1.3 DIRECT

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	14	0.0%	14.3%	14.3%	14.3%	64.3%	78.6%	7.1%
Technology Officers (Equipment Users)	10	0.0%	0.0%	0.0%	30.0%	60.0%	90.0%	10.0%
Manufacturers	14	0.0%	7.1%	7.1%	21.4%	64.3%	85.7%	7.1%
Management: Operational	14	7.1%	0.0%	7.1%	35.7%	57.1%	92.9%	0.0%
Physicians	13	0.0%	23.1%	23.1%	30.8%	46.2%	76.9%	0.0%
Management: Senior	13	7.7%	23.1%	30.8%	15.4%	53.8%	69.2%	0.0%
Nurses	13	0.0%	0.0%	0.0%	61.5%	38.5%	100.0%	0.0%
Information Technologists	13	7.7%	15.4%	23.1%	30.8%	23.1%	53.8%	23.1%
Support Services	12	8.3%	16.7%	25.0%	58.3%	8.3%	66.7%	8.3%
Lab	13	0.0%	23.1%	23.1%	15.4%	38.5%	53.8%	23.1%
Allied Health	12	0.0%	41.7%	41.7%	8.3%	33.3%	41.7%	16.7%
Board of Directors	13	30.8%	23.1%	53.8%	7.7%	0.0%	7.7%	38.5%
Patients	13	46.2%	7.7%	53.8%	23.1%	7.7%	30.8%	15.4%
Community	13	46.2%	30.8%	76.9%	0.0%	0.0%	0.0%	23.1%

Table C12. Extent of Stakeholder Involvement Responses associated with the DIRECT Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.1.4 MONITOR

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	12	0.0%	8.3%	8.3%	0.0%	83.3%	83.3%	8.3%
Technology Officers (Equipment Users)	9	0.0%	0.0%	0.0%	44.4%	33.3%	77.8%	22.2%
Manufacturers	11	0.0%	0.0%	0.0%	36.4%	63.6%	100.0%	0.0%
Management: Operational	12	0.0%	16.7%	16.7%	16.7%	66.7%	83.3%	0.0%
Physicians	10	0.0%	40.0%	40.0%	20.0%	40.0%	60.0%	0.0%
Management: Senior	10	10.0%	10.0%	20.0%	10.0%	70.0%	80.0%	0.0%
Nurses	10	0.0%	0.0%	0.0%	20.0%	80.0%	100.0%	0.0%
Information Technologists	10	10.0%	10.0%	20.0%	40.0%	30.0%	70.0%	10.0%
Support Services	9	22.2%	11.1%	33.3%	22.2%	44.4%	66.7%	0.0%
Lab	9	11.1%	11.1%	22.2%	33.3%	22.2%	55.6%	22.2%
Allied Health	8	25.0%	25.0%	50.0%	12.5%	12.5%	25.0%	25.0%
Board of Directors	9	44.4%	11.1%	55.6%	11.1%	11.1%	22.2%	22.2%
Patients	10	30.0%	10.0%	40.0%	20.0%	10.0%	30.0%	30.0%
Community	9	33.3%	22.2%	55.6%	11.1%	0.0%	11.1%	33.3%

Table C13. Extent of Stakeholder Involvement Responses associated with the MONITOR Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.1.5 HIS

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	15	6.7%	6.7%	13.3%	13.3%	53.3%	66.7%	20.0%
Technology Officers (Equipment Users)	14	0.0%	7.1%	7.1%	28.6%	57.1%	85.7%	7.1%
Manufacturers	14	7.1%	7.1%	14.3%	28.6%	42.9%	71.4%	14.3%
Management: Operational	15	6.7%	0.0%	6.7%	40.0%	53.3%	93.3%	0.0%
Physicians	16	12.5%	12.5%	25.0%	25.0%	43.8%	68.8%	6.3%
Management: Senior	16	12.5%	0.0%	12.5%	18.8%	68.8%	87.5%	0.0%
Nurses	15	6.7%	26.7%	33.3%	20.0%	40.0%	60.0%	6.7%
Information Technologists	15	6.7%	0.0%	6.7%	20.0%	73.3%	93.3%	0.0%
Support Services	14	14.3%	28.6%	42.9%	35.7%	21.4%	57.1%	0.0%
Lab	14	14.3%	0.0%	14.3%	28.6%	28.6%	57.1%	28.6%
Allied Health	14	28.6%	7.1%	35.7%	21.4%	28.6%	50.0%	14.3%
Board of Directors	14	21.4%	21.4%	42.9%	0.0%	50.0%	50.0%	7.1%
Patients	14	35.7%	35.7%	71.4%	14.3%	0.0%	14.3%	14.3%
Community	14	42.9%	28.6%	71.4%	7.1%	7.1%	14.3%	14.3%

Table C14. Extent of Stakeholder Involvement Responses associated with the HIS Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.1.6 OTHER

STAKEHOLDER	TOTAL Number of Responses	Low Extent	Low-Middle Extent	Low +Low-Middle	Middle-High Extent	High Extent	Middle-High + High	N/A
Biomedical/Clinical Engineers	6	0.0%	16.7%	16.7%	16.7%	50.0%	66.7%	16.7%
Technology Officers (Equipment Users)	5	0.0%	20.0%	20.0%	60.0%	20.0%	80.0%	0.0%
Manufacturers	5	20.0%	0.0%	20.0%	80.0%	0.0%	80.0%	0.0%
Management: Operational	6	0.0%	0.0%	0.0%	16.7%	83.3%	100.0%	0.0%
Physicians	6	16.7%	16.7%	33.3%	16.7%	50.0%	66.7%	0.0%
Management: Senior	6	16.7%	0.0%	16.7%	16.7%	66.7%	83.3%	0.0%
Nurses	6	16.7%	16.7%	33.3%	16.7%	50.0%	66.7%	0.0%
Information Technologists	5	20.0%	0.0%	20.0%	60.0%	20.0%	80.0%	0.0%
Support Services	5	0.0%	40.0%	40.0%	40.0%	20.0%	60.0%	0.0%
Lab	5	20.0%	0.0%	20.0%	40.0%	20.0%	60.0%	20.0%
Allied Health	5	0.0%	20.0%	20.0%	20.0%	40.0%	60.0%	20.0%
Board of Directors	5	0.0%	60.0%	60.0%	20.0%	20.0%	40.0%	0.0%
Patients	5	40.0%	20.0%	60.0%	40.0%	0.0%	40.0%	0.0%
Community	5	40.0%	40.0%	80.0%	20.0%	0.0%	20.0%	0.0%

Table C15. Extent of Stakeholder Involvement Responses associated with the OTHER Technology Category. Percentage distribution of responses on low-high scale for each given stakeholder.

C.4.2 Stakeholder Involvement and Satisfaction

		Extent of Nurse Satisfaction:			
		Low	Low-Middle	Middle-High	High
Extent of Nurse Involvement in Assessment	Low	0.0%	50.0%	50.0%	0.0%
	Low-Middle	16.7%	16.7%	33.3%	33.3%
	Middle-High	0.0%	33.3%	46.7%	20.0%
	High	6.7%	0.0%	33.3%	60.0%
	N/A	33.3%	66.7%	0.0%	0.0%

Table C16. Nurse satisfaction with implemented technology as a function of the extent of nurse involvement in the assessment process.

		Extent of Physician Satisfaction:			
		Low	Low-Middle	Middle-High	High
Extent of Physician Involvement in Assessment	Low	100.0%	0.0%	0.0%	0.0%
	Low-Middle	0.0%	14.3%	28.6%	57.1%
	Middle-High	0.0%	13.3%	46.7%	40.0%
	High	8.7%	0.0%	30.4%	60.9%
	N/A	33.3%	33.3%	33.3%	0.0%

Table C17. Physician satisfaction with implemented technology as a function of the extent of physician involvement in the assessment process.

C.5 Levels of Importance Attributed to Factors Involved in Health Technology Assessment

C.5.1 All Responses

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	55	0.0%	0.0%	0.0%	12.7%	87.3%	100.0%
Cost	55	0.0%	7.3%	7.3%	40.0%	52.7%	92.7%
Security and Safety	53	3.8%	7.5%	11.3%	32.1%	56.6%	88.7%
IT/IS Interconnections	54	5.6%	14.8%	20.4%	29.6%	50.0%	79.6%
Ergonomics/User Friendliness	54	5.6%	18.5%	24.1%	42.6%	33.3%	75.9%
Master Facility Plan of Hospital/Existing Space	53	5.7%	22.6%	28.3%	37.7%	34.0%	71.7%
Legal Information/Standards	52	11.5%	17.3%	28.8%	28.8%	42.3%	71.2%
Service Contracts	55	3.6%	30.9%	34.5%	38.2%	27.3%	65.5%
Infection Control	53	20.8%	17.0%	37.7%	24.5%	37.7%	62.3%

Table C18. Levels of Importance Attributed to Various Factors in HTA. All responses are included. Percentage distribution of responses on low-high scale for each given factor.

C.5.2 Responses by Type of Technology

C.5.2.1 PACS

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	11	0.0%	0.0%	0.0%	18.2%	81.8%	100.0%
Cost	11	0.0%	9.1%	9.1%	27.3%	63.6%	90.9%
Security and Safety	11	9.1%	9.1%	18.2%	54.5%	27.3%	81.8%
IT/IS Interconnections	11	0.0%	9.1%	9.1%	36.4%	54.5%	90.9%
Ergonomics/User Friendliness	11	0.0%	18.2%	18.2%	72.7%	9.1%	81.8%
Master Facility Plan of Hospital/Existing Space	10	10.0%	10.0%	20.0%	60.0%	20.0%	80.0%
Legal Information/Standards	10	20.0%	20.0%	40.0%	40.0%	20.0%	60.0%
Service Contracts	11	0.0%	45.5%	45.5%	18.2%	36.4%	54.5%
Infection Control	10	20.0%	40.0%	60.0%	30.0%	10.0%	40.0%

Table C19. Levels of Importance of Factors Responses associated with the PACS Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.5.2.2 HIGH

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	21	0.0%	0.0%	0.0%	14.3%	85.7%	100.0%
Cost	21	0.0%	4.8%	4.8%	57.1%	38.1%	95.2%
Security and Safety	21	0.0%	4.8%	4.8%	38.1%	57.1%	95.2%
IT/IS Interconnections	21	0.0%	19.0%	19.0%	42.9%	38.1%	81.0%
Ergonomics/User Friendliness	21	4.8%	28.6%	33.3%	57.1%	9.5%	66.7%
Master Facility Plan of Hospital/Existing Space	20	0.0%	10.0%	10.0%	50.0%	40.0%	90.0%
Legal Information/Standards	20	5.0%	30.0%	35.0%	20.0%	45.0%	65.0%
Service Contracts	21	4.8%	28.6%	33.3%	42.9%	23.8%	66.7%
Infection Control	21	14.3%	23.8%	38.1%	28.6%	33.3%	61.9%

Table C20. Levels of Importance of Factors Responses associated with the HIGH Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.5.2.3 DIRECT

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	14	0.0%	0.0%	0.0%	14.3%	85.7%	100.0%
Cost	14	0.0%	7.1%	7.1%	35.7%	57.1%	92.9%
Security and Safety	14	0.0%	0.0%	0.0%	21.4%	78.6%	100.0%
IT/IS Interconnections	14	14.3%	14.3%	28.6%	42.9%	28.6%	71.4%
Ergonomics/User Friendliness	14	0.0%	14.3%	14.3%	57.1%	28.6%	85.7%
Master Facility Plan of Hospital/Existing Space	14	0.0%	14.3%	14.3%	35.7%	50.0%	85.7%
Legal Information/Standards	14	7.1%	14.3%	21.4%	14.3%	64.3%	78.6%
Service Contracts	14	14.3%	42.9%	57.1%	14.3%	28.6%	42.9%
Infection Control	14	14.3%	0.0%	14.3%	28.6%	57.1%	85.7%

Table C21. Levels of Importance of Factors Responses associated with the DIRECT Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.5.2.4 MONITOR

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	12	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Cost	12	0.0%	16.7%	16.7%	41.7%	41.7%	83.3%
Security and Safety	11	9.1%	0.0%	9.1%	18.2%	72.7%	90.9%
IT/IS Interconnections	12	8.3%	25.0%	33.3%	8.3%	58.3%	66.7%
Ergonomics/User Friendliness	12	0.0%	8.3%	8.3%	16.7%	75.0%	91.7%
Master Facility Plan of Hospital/Existing Space	12	0.0%	41.7%	41.7%	8.3%	50.0%	58.3%
Legal Information/Standards	12	16.7%	16.7%	33.3%	8.3%	58.3%	66.7%
Service Contracts	12	0.0%	50.0%	50.0%	16.7%	33.3%	50.0%
Infection Control	12	8.3%	16.7%	25.0%	16.7%	58.3%	75.0%

Table C22. Levels of Importance of Factors Responses associated with the MONITOR Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.5.2.5 HIS

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	16	0.0%	0.0%	0.0%	6.3%	93.8%	100.0%
Cost	16	0.0%	0.0%	0.0%	31.3%	68.8%	100.0%
Security and Safety	15	0.0%	0.0%	0.0%	33.3%	66.7%	100.0%
IT/IS Interconnections	15	0.0%	13.3%	13.3%	13.3%	73.3%	86.7%
Ergonomics/User Friendliness	15	6.7%	20.0%	26.7%	33.3%	40.0%	73.3%
Master Facility Plan of Hospital/Existing Space	15	13.3%	6.7%	20.0%	40.0%	40.0%	80.0%
Legal Information/Standards	14	7.1%	14.3%	21.4%	28.6%	50.0%	78.6%
Service Contracts	16	0.0%	18.8%	18.8%	50.0%	31.3%	81.3%
Infection Control	15	26.7%	20.0%	46.7%	26.7%	26.7%	53.3%

Table C23. Levels of Importance of Factors Responses associated with the HIS Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.5.2.6 OTHER

FACTOR	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Potential to Improve Patient Care	6	0.0%	0.0%	0.0%	16.7%	83.3%	100.0%
Cost	6	0.0%	0.0%	0.0%	50.0%	50.0%	100.0%
Security and Safety	5	0.0%	0.0%	0.0%	40.0%	60.0%	100.0%
IT/IS Interconnections	5	0.0%	20.0%	20.0%	40.0%	40.0%	80.0%
Ergonomics/User Friendliness	5	0.0%	20.0%	20.0%	60.0%	20.0%	80.0%
Master Facility Plan of Hospital/Existing Space	5	0.0%	0.0%	0.0%	80.0%	20.0%	100.0%
Legal Information/Standards	5	0.0%	0.0%	0.0%	20.0%	80.0%	100.0%
Service Contracts	6	16.7%	33.3%	50.0%	33.3%	16.7%	50.0%
Infection Control	5	0.0%	0.0%	0.0%	40.0%	60.0%	100.0%

Table C24. Levels of Importance of Factors Responses associated with the OTHER Technology Category. Percentage distribution of responses on low-high scale for each given factor.

C.6 Equipment Considerations

C.6.1 All Responses

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	53	3.8%	18.9%	22.6%	39.6%	37.7%	77.4%
Various Service Providers	51	21.6%	23.5%	45.1%	33.3%	21.6%	54.9%
Disposability Considerations	49	44.9%	26.5%	71.4%	22.4%	6.1%	28.6%
Expandability	53	0.0%	9.4%	9.4%	49.1%	41.5%	90.6%
Parts	54	1.9%	11.1%	13.0%	46.3%	40.7%	87.0%
Product Options	53	1.9%	11.3%	13.2%	39.6%	47.2%	86.8%
Service Agreements	53	3.8%	22.6%	26.4%	37.7%	35.8%	73.6%
Training Requirements	54	0.0%	5.6%	5.6%	27.8%	66.7%	94.4%
Upgrade Paths	51	0.0%	11.8%	11.8%	35.3%	52.9%	88.2%

Table C25. Levels of Importance Attributed to Various Equipment Considerations in HTA. All responses are included. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2 Responses by Type of Technology

C.6.2.1 PACS

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	11	0.0%	36.4%	36.4%	36.4%	27.3%	63.6%
Various Service Providers	10	30.0%	30.0%	60.0%	40.0%	0.0%	40.0%
Disposability Considerations	9	55.6%	33.3%	88.9%	11.1%	0.0%	11.1%
Expandability	11	0.0%	9.1%	9.1%	45.5%	45.5%	90.9%
Parts	11	9.1%	18.2%	27.3%	36.4%	36.4%	72.7%
Product Options	10	0.0%	0.0%	0.0%	60.0%	40.0%	100.0%
Service Agreements	11	0.0%	18.2%	18.2%	45.5%	36.4%	81.8%
Training Requirements	11	0.0%	0.0%	0.0%	54.5%	45.5%	100.0%
Upgrade Paths	11	0.0%	9.1%	9.1%	27.3%	63.6%	90.9%

Table C26. Levels of Importance of Equipment Considerations Responses associated with the PACS Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2.2 HIGH

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	21	0.0%	19.0%	19.0%	52.4%	28.6%	81.0%
Various Service Providers	20	25.0%	20.0%	45.0%	40.0%	15.0%	55.0%
Disposability Considerations	20	50.0%	20.0%	70.0%	25.0%	5.0%	30.0%
Expandability	21	0.0%	14.3%	14.3%	57.1%	28.6%	85.7%
Parts	21	0.0%	9.5%	9.5%	57.1%	33.3%	90.5%
Product Options	20	0.0%	5.0%	5.0%	55.0%	40.0%	95.0%
Service Agreements	21	4.8%	19.0%	23.8%	33.3%	42.9%	76.2%
Training Requirements	21	0.0%	0.0%	0.0%	38.1%	61.9%	100.0%
Upgrade Paths	21	0.0%	0.0%	0.0%	47.6%	52.4%	100.0%

Table C27. Levels of Importance of Equipment Considerations Responses associated with the HIGH Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2.3 DIRECT

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	13	0.0%	0.0%	0.0%	38.5%	61.5%	100.0%
Various Service Providers	13	15.4%	7.7%	23.1%	38.5%	38.5%	76.9%
Disposability Considerations	13	30.8%	30.8%	61.5%	30.8%	7.7%	38.5%
Expandability	14	0.0%	7.1%	7.1%	64.3%	28.6%	92.9%
Parts	14	0.0%	0.0%	0.0%	57.1%	42.9%	100.0%
Product Options	14	0.0%	7.1%	7.1%	50.0%	42.9%	92.9%
Service Agreements	14	0.0%	14.3%	14.3%	42.9%	42.9%	85.7%
Training Requirements	14	0.0%	0.0%	0.0%	35.7%	64.3%	100.0%
Upgrade Paths	13	0.0%	7.7%	7.7%	61.5%	30.8%	92.3%

Table C28. Levels of Importance of Equipment Considerations Responses associated with the DIRECT Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2.4 MONITOR

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	10	0.0%	0.0%	0.0%	40.0%	60.0%	100.0%
Various Service Providers	10	20.0%	20.0%	40.0%	30.0%	30.0%	60.0%
Disposability Considerations	10	20.0%	50.0%	70.0%	0.0%	30.0%	30.0%
Expandability	11	0.0%	0.0%	0.0%	45.5%	54.5%	100.0%
Parts	11	0.0%	9.1%	9.1%	18.2%	72.7%	90.9%
Product Options	11	0.0%	0.0%	0.0%	27.3%	72.7%	100.0%
Service Agreements	11	0.0%	27.3%	27.3%	27.3%	45.5%	72.7%
Training Requirements	11	0.0%	0.0%	0.0%	18.2%	81.8%	100.0%
Upgrade Paths	10	0.0%	10.0%	10.0%	30.0%	60.0%	90.0%

Table C29. Levels of Importance of Equipment Considerations Responses associated with the MONITOR Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2.5 HIS

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	15	13.3%	33.3%	46.7%	33.3%	20.0%	53.3%
Various Service Providers	14	21.4%	42.9%	64.3%	21.4%	14.3%	35.7%
Disposability Considerations	12	66.7%	16.7%	83.3%	16.7%	0.0%	16.7%
Expandability	14	0.0%	0.0%	0.0%	42.9%	57.1%	100.0%
Parts	15	0.0%	20.0%	20.0%	46.7%	33.3%	80.0%
Product Options	14	0.0%	21.4%	21.4%	28.6%	50.0%	78.6%
Service Agreements	14	7.1%	28.6%	35.7%	21.4%	42.9%	64.3%
Training Requirements	15	0.0%	6.7%	6.7%	26.7%	66.7%	93.3%
Upgrade Paths	13	0.0%	7.7%	7.7%	23.1%	69.2%	92.3%

Table C30. Levels of Importance of Equipment Considerations Responses associated with the HIS Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.6.2.6 OTHER

EQUIPMENT CONSIDERATION	TOTAL Number of Responses	Low Level	Low-Middle Level	Low +Low-Middle	Middle-High Level	High Level	Middle-High + High
Various Vendors	6	0.0%	16.7%	16.7%	16.7%	66.7%	83.3%
Various Service Providers	5	0.0%	20.0%	20.0%	60.0%	20.0%	80.0%
Disposability Considerations	5	60.0%	20.0%	80.0%	20.0%	0.0%	20.0%
Expandability	5	0.0%	0.0%	0.0%	60.0%	40.0%	100.0%
Parts	6	0.0%	0.0%	0.0%	66.7%	33.3%	100.0%
Product Options	6	0.0%	33.3%	33.3%	16.7%	50.0%	66.7%
Service Agreements	5	0.0%	20.0%	20.0%	20.0%	60.0%	80.0%
Training Requirements	6	0.0%	0.0%	0.0%	33.3%	66.7%	100.0%
Upgrade Paths	5	0.0%	20.0%	20.0%	20.0%	60.0%	80.0%

Table C31. Levels of Importance of Equipment Considerations Responses associated with the OTHER Technology Category. Percentage distribution of responses on low-high scale for each given equipment consideration.

C.7 Unforeseen Circumstances

C.7.1 Responses by Type of Technology

C.7.1.1 PACS

	Number			Percentage		
Circumstance	YES	NO	No response	YES	NO	No response
Costs	6	2	0	75.0%	25.0%	0.0%
Renovations	5	3	0	62.5%	37.5%	0.0%
Additional Purchases	3	5	0	37.5%	62.5%	0.0%
Staffing Requirements	3	5	0	37.5%	62.5%	0.0%
Required Supplies	2	6	0	25.0%	75.0%	0.0%
Installation Time	3	5	0	37.5%	62.5%	0.0%
Training Requirements	3	5	0	37.5%	62.5%	0.0%
Average				44.6%	55.4%	0.0%

Table C32. Incidence of Unforeseen Circumstances associated with implementations in the PACS Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.1.2 HIGH

	Number			Percentage		
Circumstance	YES	NO	No response	YES	NO	No response
Costs	8	9	1	44.4%	50.0%	5.6%
Renovations	9	9	0	50.0%	50.0%	0.0%
Additional Purchases	6	11	1	33.3%	61.1%	5.6%
Staffing Requirements	5	12	1	27.8%	66.7%	5.6%
Required Supplies	5	12	1	27.8%	66.7%	5.6%
Installation Time	5	12	1	27.8%	66.7%	5.6%
Training Requirements	4	13	1	22.2%	72.2%	5.6%
Average				33.3%	61.9%	4.8%

Table C33. Incidence of Unforeseen Circumstances associated with implementations in the HIGH Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.1.3 DIRECT

Circumstance	Number YES	NO	No response	Percentage YES	NO	No response
Costs	6	8	0	42.9%	57.1%	0.0%
Renovations	9	5	0	64.3%	35.7%	0.0%
Additional Purchases	6	8	0	42.9%	57.1%	0.0%
Staffing Requirements	5	9	0	35.7%	64.3%	0.0%
Required Supplies	5	9	0	35.7%	64.3%	0.0%
Installation Time	8	6	0	57.1%	42.9%	0.0%
Training Requirements	6	8	0	42.9%	57.1%	0.0%
Average				45.9%	54.1%	0.0%

Table C34. Incidence of Unforeseen Circumstances associated with implementations in the DIRECT Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.1.4 MONITOR

Circumstance	Number YES	NO	No response	Percentage YES	NO	No response
Costs	3	7	1	27.3%	63.6%	9.1%
Renovations	6	5	0	54.5%	45.5%	0.0%
Additional Purchases	4	6	1	36.4%	54.5%	9.1%
Staffing Requirements	2	7	2	18.2%	63.6%	18.2%
Required Supplies	1	8	2	9.1%	72.7%	18.2%
Installation Time	5	5	1	45.5%	45.5%	9.1%
Training Requirements	4	5	2	36.4%	45.5%	18.2%
Average				32.5%	55.8%	11.7%

Table C35. Incidence of Unforeseen Circumstances associated with implementations in the MONITOR Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.1.5 HIS

Circumstance	Number YES	NO	No response	Percentage YES	NO	No response
Costs	10	6	0	62.5%	37.5%	0.0%
Renovations	6	8	2	37.5%	50.0%	12.5%
Additional Purchases	8	7	1	50.0%	43.8%	6.3%
Staffing Requirements	7	8	1	43.8%	50.0%	6.3%
Required Supplies	5	9	2	31.3%	56.3%	12.5%
Installation Time	6	8	2	37.5%	50.0%	12.5%
Training Requirements	11	5	0	68.8%	31.3%	0.0%
Average				47.3%	45.5%	7.1%

Table C36. Incidence of Unforeseen Circumstances associated with implementations in the HIS Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.1.6 OTHER

Circumstance	Number			Percentage		
	YES	NO	No response	YES	NO	No response
Costs	3	1	0	75.0%	25.0%	0.0%
Renovations	1	2	1	25.0%	50.0%	25.0%
Additional Purchases	2	2	0	50.0%	50.0%	0.0%
Staffing Requirements	2	1	1	50.0%	25.0%	25.0%
Required Supplies	1	2	1	25.0%	50.0%	25.0%
Installation Time	1	2	1	25.0%	50.0%	25.0%
Training Requirements	3	1	0	75.0%	25.0%	0.0%
Average				46.4%	39.3%	14.3%

Table C37. Incidence of Unforeseen Circumstances associated with implementations in the OTHER Technology Category. Absolute Number and Percentage distribution of responses for each given circumstance. Each circumstance is independent of the others.

C.7.2 Training Requirements and Cost –

	Yes	No	%YES	%NO
Low	0	0		
Low-Middle	1	0	100.0%	0.0%
Middle-High	7	6	53.8%	46.2%
High	12	18	40.0%	60.0%
	20	24		

Table C38. Incidence of Unforeseen Training Requirements as a function of the Level of Importance attributed to Training Requirements as an Equipment Consideration during HTA.

	Yes	No	%YES	%NO
Low	0	0		
Low-Middle	3	1	75.0%	25.0%
Middle-High	11	10	52.4%	47.6%
High	12	13	48.0%	52.0%
	26	24		

Table C39. Incidence of Unforeseen Costs as a function of the Level of Importance attributed to Costs as a Factor for Consideration during HTA.

Note that with regard to Training Requirements, both the numbers of unforeseen and lack of unforeseen instances do not total those reported in Table 9 in §4.6. This results from the fact that the table above was constructed for the purposes of dependency evaluation; as such, only the foreseen/unforeseen responses for which there were corresponding responses regarding the level of importance attributed to the consideration of Training Requirements in the same questionnaires are included.

C.8 Satisfaction with Technology and Equipment

	The New Technology **is** Meeting Expectations		The New Technology is **not** Meeting Expectations	
Number of Responses	62	81.6%	14	18.4%
Type of Technology				
PACS	5	8.1%	2	14.3%
HIGH	20	32.3%	4	28.6%
DIRECT	11	17.7%	0	0.0%
MONITOR	8	12.9%	3	14.3%
HIS	12	19.4%	3	21.4%
OTHER	6	9.7%	2	21.4%
	62	100.0%	14	100.0%
Position of Respondent				
BIOMED	19	30.6%	7	50.0%
IT/IS	1	1.6%	3	21.4%
MATERIALS	7	11.3%	2	14.3%
MANAGERS/DIRECTORS	20	32.3%	2	14.3%
SENIOR	10	16.1%	0	0.0%
unspecified	5	8.1%	0	0.0%
	62	100.0%	14	100.0%
Implementation Strategy				
Immediate	36	58.1%	6	42.9%
Phased-In	24	38.7%	7	50.0%
unspecified	2	3.2%	1	7.1%
	62	100.0%	14	100.0%

Table C40. Distribution of responses – by Technology Type, Position of Respondent, and by Implementation Strategy – to the question regarding the meeting of expectations by the new technology.

Category	Item	% of Responses for Given Item: The New Technology **is** Meeting Expectations	% of Responses for Given Item The New Technology **is not** Meeting Expectations	Total
Type of Technology	PACS	71.4%	28.6%	100.0
	HIGH	83.3%	16.7%	100.0
	DIRECT	100.0%	0.0%	100.0
	MONITOR	72.7%	27.3%	100.0
	HIS	80.0%	20.0%	100.0
	OTHER	75.0%	25.0%	100.0
Position of Respondent	BIOMED	73.1%	26.9%	100.0
	IT/IS	25.0%	75.0%	100.0
	MATERIALS	77.8%	22.2%	100.0
	MANAGERS/DIRECTORS	90.9%	9.1%	100.0
	SENIOR	100.0%	0.0%	100.0
	unspecified	100.0%	0.0%	100.0
Implementation Strategy	Immediate	85.7%	14.3%	100.0
	Phased-In	77.4%	22.6%	100.0
	unspecified	66.7%	33.3%	100.0

Table C41. Percentage Distribution of Responses to the query regarding the meeting of expectations by the new technology for each item in each category – Technology Type, Position of Respondent, Implementation Strategy.

C.9 Adequate Consultation

Adequately Consulted?	BIOMED	IT/IS	MANAGERS/ DIRECTORS	MATERIALS	SENIOR	Unknown	TOTAL
YES	12.0	2.0	18.0	7.0	9.0	2.0	50.0
NO	2.0	1.0	1.0		1.0	1.0	6.0
Total	14.0	3.0	19.0	7.0	10.0	3.0	56.0

Table C50. Responses to the question "With regard to the acquisition process in general, do you feel that you are sufficiently consulted and/or that your expertise and contributions are optimally employed?" By Position of Respondent.

Adequately Consulted?	CANCER CENTRE	CC/LTC	COMMUNITY	PSY/REHAB	REGIONAL	TEACHING	UNKNOWN	TOTAL
YES			31.0		1.0	16.0	2.0	50.0
NO			2.0			4.0		6.0
Total			33.0		1.0	20.0	2.0	56.0

Table C51. Responses to the question "With regard to the acquisition process in general, do you feel that you are sufficiently consulted and/or that your expertise and contributions are optimally employed?" By Type of Facility.

C.10 Measurements of Success

Survey respondents were asked to indicate their level of agreement, using a scale of one to four, with nineteen statements. **One** corresponded with **strongly disagree** and **four** corresponded with **strongly agree.**

Statements in Questionnaire

1) The new technology has met with high levels of success in the hospital.

2) Patient care has improved substantially as a result of the implementation of the new/emerging technology.

3) Anticipated cost savings have been realized.

4) Time savings are significant for the patient.

5) Time savings are significant for the user/technician.

6) Noise reduction has been achieved in patient care areas.

7) Administrative staff satisfaction is high.

8) Physician/Surgeon satisfaction is high.

9) Nurse satisfaction is high.

10) User satisfaction is high.

11) Service Contracts meet expectations.

12) The supplier tailored the system to meet the needs of our organization.

13) The supplier provided adequate training and supportive resources.

14) The technology is easy to use.

15) The technology is easy to maintain.

16) The system is reliable.

17) The assessment process met all of our needs.

18) No complications arose during implementation and expectations were met.

19) We recommend the technology to others.

C.10.1 All Responses

	Average Level	Standard Deviation	Number of Responses 1	2	3	4	N/A	TOTAL	Percentage of Responses Strongly Disagree	Disagree	In Disagree-ment	Agree	Strongly Agree	In Agree-ment	N/A
1	3.4	0.7	1	3	24	25	0	53	1.9%	5.7%	**7.5%**	45.3%	47.2%	**92.5%**	0.0%
2	3.2	0.8	1	9	22	21	0	53	1.9%	17.0%	**18.9%**	41.5%	39.6%	**81.1%**	0.0%
3	2.2	0.8	7	19	11	2	12	51	13.7%	37.3%	**51.0%**	21.6%	3.9%	**25.5%**	23.5%
4	3.0	0.9	1	15	14	17	4	51	2.0%	29.4%	**31.4%**	27.5%	33.3%	**60.8%**	7.8%
5	3.0	0.9	2	14	17	16	2	51	3.9%	27.5%	**31.4%**	33.3%	31.4%	**64.7%**	3.9%
6	2.4	1.0	5	5	8	2	32	52	9.6%	9.6%	**19.2%**	15.4%	3.8%	**19.2%**	61.5%
7	2.9	0.8	3	10	25	13	0	51	5.9%	19.6%	**25.5%**	49.0%	25.5%	**74.5%**	0.0%
8	3.3	0.9	4	5	17	26	0	52	7.7%	9.6%	**17.3%**	32.7%	50.0%	**82.7%**	0.0%
9	3.0	0.9	3	9	17	16	0	45	6.7%	20.0%	**26.7%**	37.8%	35.6%	**73.3%**	0.0%
10	3.3	0.7	1	6	21	21	0	49	2.0%	12.2%	**14.3%**	42.9%	42.9%	**85.7%**	0.0%
11	3.0	0.8	3	6	23	10	9	51	5.9%	11.8%	**17.6%**	45.1%	19.6%	**64.7%**	17.6%
12	3.1	0.8	3	4	27	13	4	51	5.9%	7.8%	**13.7%**	52.9%	25.5%	**78.4%**	7.8%
13	3.1	0.7	2	6	28	14	0	50	4.0%	12.0%	**16.0%**	56.0%	28.0%	**84.0%**	0.0%
14	3.3	0.6	0	4	30	18	0	52	0.0%	7.7%	**7.7%**	57.7%	34.6%	**92.3%**	0.0%
15	3.0	0.7	1	10	30	10	0	51	2.0%	19.6%	**21.6%**	58.8%	19.6%	**78.4%**	0.0%
16	3.3	0.7	0	6	23	23	0	52	0.0%	11.5%	**11.5%**	44.2%	44.2%	**88.5%**	0.0%
17	2.9	0.7	1	13	28	9	0	51	2.0%	25.5%	**27.5%**	54.9%	17.6%	**72.5%**	0.0%
18	2.5	0.9	9	16	19	7	0	51	17.6%	31.4%	**49.0%**	37.3%	13.7%	**51.0%**	0.0%
19	3.3	0.7	1	4	26	20	0	51	2.0%	7.8%	**9.8%**	51.0%	39.2%	**90.2%**	0.0%

Table C52. Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. All survey responses are included. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement.

C.10.2 Responses by Category

In the following tables, the columns "Difference" provide the percentage point disparity between the Total Percentage 'In Agreement' and 'In Disagreement' as given in the table above (Table C52) and the percentages 'In Agreement' and 'In Disagreement' associated with each of the individual entries (community, teaching; PACS, HIGH, etc.; SENIOR, BIOMED, etc.) of the analysis categories (Type of Technology, Type of Facility, Position of Respondent).

A **negative value** in one of the 'Difference' columns (agreement or disagreement) indicates the percentage in agreement or disagreement for the given category item is **lower** than that for the entire response set (i.e. the % given in the table above – Table C52). Meanwhile, a **positive value** in one of the difference columns (agreement or disagreement) indicates the percentage in agreement or disagreement is **higher** relative to the entire response set.

C.10.2.1 Responses to Measurement of Success by Type of Facility

C.10.2.1.1 Community

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	31	3.2%	6.5%	9.7%	2.1	35.5%	54.8%	90.3%	-2.1
2	31	0.0%	25.8%	25.8%	6.9	32.3%	41.9%	74.2%	-6.9
3	30	10.0%	36.7%	46.7%	-4.3	20.0%	6.7%	26.7%	1.2
4	30	3.3%	40.0%	43.3%	12.0	13.3%	33.3%	46.7%	-14.1
5	30	3.3%	33.3%	36.7%	5.3	26.7%	33.3%	60.0%	-4.7
6	31	9.7%	3.2%	12.9%	-6.3	19.4%	3.2%	22.6%	3.3
7	29	6.9%	17.2%	24.1%	-1.4	48.3%	27.6%	75.9%	1.4
8	31	9.7%	12.9%	22.6%	5.3	32.3%	45.2%	77.4%	-5.3
9	26	7.7%	11.5%	19.2%	-7.4	50.0%	30.8%	80.8%	7.4
10	28	0.0%	14.3%	14.3%	0.0	46.4%	39.3%	85.7%	0.0
11	29	6.9%	17.2%	24.1%	6.5	37.9%	17.2%	55.2%	-9.5
12	29	6.9%	3.4%	10.3%	-3.4	58.6%	24.1%	82.8%	4.3
13	28	3.6%	10.7%	14.3%	-1.7	64.3%	21.4%	85.7%	1.7
14	30	0.0%	6.7%	6.7%	-1.0	56.7%	36.7%	93.3%	1.0
15	29	3.4%	13.8%	17.2%	-4.3	62.1%	20.7%	82.8%	4.3
16	30	0.0%	13.3%	13.3%	1.8	46.7%	40.0%	86.7%	-1.8
17	29	3.4%	24.1%	27.6%	0.1	55.2%	17.2%	72.4%	-0.1
18	29	24.1%	27.6%	51.7%	2.7	27.6%	20.7%	48.3%	-2.7
19	29	3.4%	6.9%	10.3%	0.5	48.3%	41.4%	89.7%	-0.5

Table C53. Community hospital response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.1.2 Teaching

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	19	0.0%	0.0%	0.0%	-7.5	57.9%	42.1%	100.0%	7.5
2	19	0.0%	5.3%	5.3%	-13.6	57.9%	36.8%	94.7%	13.6
3	18	16.7%	44.4%	61.1%	10.1	16.7%	0.0%	16.7%	-8.8
4	19	0.0%	15.8%	15.8%	-15.6	42.1%	36.8%	78.9%	18.2
5	18	5.6%	16.7%	22.2%	-9.2	38.9%	33.3%	72.2%	7.5
6	19	10.5%	21.1%	31.6%	12.3	5.3%	5.3%	10.5%	-8.7
7	19	5.3%	26.3%	31.6%	6.1	52.6%	15.8%	68.4%	-6.1
8	18	0.0%	5.6%	5.6%	-11.8	33.3%	61.1%	94.4%	11.8
9	16	0.0%	37.5%	37.5%	10.8	18.8%	43.8%	62.5%	-10.8
10	18	0.0%	5.6%	5.6%	-8.7	38.9%	55.6%	94.4%	8.7
11	19	5.3%	5.3%	10.5%	-7.1	52.6%	26.3%	78.9%	14.2
12	19	5.3%	15.8%	21.1%	7.3	42.1%	31.6%	73.7%	-4.7
13	19	0.0%	15.8%	15.8%	-0.2	42.1%	42.1%	84.2%	0.2
14	19	0.0%	10.5%	10.5%	2.8	57.9%	31.6%	89.5%	-2.8
15	19	0.0%	31.6%	31.6%	10.0	47.4%	21.1%	68.4%	-10.0
16	19	0.0%	10.5%	10.5%	-1.0	36.8%	52.6%	89.5%	1.0
17	19	0.0%	21.1%	21.1%	-6.4	57.9%	21.1%	78.9%	6.4
18	19	5.3%	36.8%	42.1%	-6.9	52.6%	5.3%	57.9%	6.9
19	19	0.0%	10.5%	10.5%	0.7	52.6%	36.8%	89.5%	-0.7

Table C54. Teaching hospital response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.2 Responses to Measurement of Success by Type of Technology

C.10.2.2.1 PACS

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	10	0.0%	10.0%	10.0%	2.5	50.0%	40.0%	90.0%	-2.5
2	10	0.0%	30.0%	30.0%	11.1	50.0%	20.0%	70.0%	-11.1
3	10	10.0%	60.0%	70.0%	19.0	20.0%	0.0%	20.0%	-5.5
4	10	0.0%	60.0%	60.0%	28.6	30.0%	10.0%	40.0%	-20.8
5	10	0.0%	50.0%	50.0%	18.6	10.0%	40.0%	50.0%	-14.7
6	10	10.0%	10.0%	20.0%	0.8	20.0%	0.0%	20.0%	0.8
7	10	10.0%	30.0%	40.0%	14.5	50.0%	10.0%	60.0%	-14.5
8	10	0.0%	20.0%	20.0%	2.7	60.0%	20.0%	80.0%	-2.7
9	7	14.3%	14.3%	28.6%	1.9	57.1%	14.3%	71.4%	-1.9
10	10	0.0%	10.0%	10.0%	-4.3	60.0%	30.0%	90.0%	4.3
11	10	10.0%	20.0%	30.0%	12.4	40.0%	30.0%	70.0%	5.3
12	10	10.0%	20.0%	30.0%	16.3	30.0%	30.0%	60.0%	-18.4
13	10	0.0%	20.0%	20.0%	4.0	60.0%	20.0%	80.0%	-4.0
14	10	0.0%	10.0%	10.0%	2.3	50.0%	40.0%	90.0%	-2.3
15	10	10.0%	20.0%	30.0%	8.4	40.0%	30.0%	70.0%	-8.4
16	10	0.0%	20.0%	20.0%	8.5	50.0%	30.0%	80.0%	-8.5
17	10	0.0%	20.0%	20.0%	-7.5	60.0%	20.0%	80.0%	7.5
18	10	20.0%	30.0%	50.0%	1.0	50.0%	0.0%	50.0%	-1.0
19	10	0.0%	10.0%	10.0%	0.2	50.0%	40.0%	90.0%	-0.2

Table C54. PACS response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.2.2 HIGH

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	20	0.0%	0.0%	0.0%	-7.5	50.0%	50.0%	100.0%	7.5
2	20	0.0%	10.0%	10.0%	-8.9	60.0%	30.0%	90.0%	8.9
3	19	5.3%	57.9%	63.2%	12.2	5.3%	5.3%	10.5%	-15.0
4	20	0.0%	35.0%	35.0%	3.6	25.0%	40.0%	65.0%	4.2
5	19	0.0%	36.8%	36.8%	5.5	36.8%	26.3%	63.2%	-1.5
6	20	10.0%	10.0%	20.0%	0.8	25.0%	5.0%	30.0%	10.8
7	20	0.0%	25.0%	25.0%	-0.5	40.0%	35.0%	75.0%	0.5
8	20	0.0%	5.0%	5.0%	-12.3	50.0%	45.0%	95.0%	12.3
9	15	0.0%	20.0%	20.0%	-6.7	53.3%	26.7%	80.0%	6.7
10	19	0.0%	5.3%	5.3%	-9.0	42.1%	52.6%	94.7%	9.0
11	20	0.0%	10.0%	10.0%	-7.6	65.0%	15.0%	80.0%	15.3
12	20	0.0%	10.0%	10.0%	-3.7	65.0%	20.0%	85.0%	6.6
13	20	0.0%	15.0%	15.0%	-1.0	65.0%	20.0%	85.0%	1.0
14	20	0.0%	5.0%	5.0%	-2.7	65.0%	30.0%	95.0%	2.7
15	20	5.0%	15.0%	20.0%	-1.6	65.0%	15.0%	80.0%	1.6
16	20	0.0%	10.0%	10.0%	-1.5	40.0%	50.0%	90.0%	1.5
17	20	0.0%	10.0%	10.0%	-17.5	80.0%	10.0%	90.0%	17.5
18	20	5.0%	35.0%	40.0%	-9.0	50.0%	10.0%	60.0%	9.0
19	19	0.0%	5.3%	5.3%	-4.5	63.2%	31.6%	94.7%	4.5

Table C55. HIGH response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns

C.10.2.2.3 DIRECT

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	14	0.0%	0.0%	0.0%	-7.5	64.3%	35.7%	100.0%	7.5
2	14	0.0%	7.1%	7.1%	-11.7	50.0%	42.9%	92.9%	11.7
3	13	15.4%	30.8%	46.2%	-4.8	15.4%	15.4%	30.8%	5.3
4	13	0.0%	15.4%	15.4%	-16.0	30.8%	30.8%	61.5%	0.8
5	13	0.0%	23.1%	23.1%	-8.3	38.5%	38.5%	76.9%	12.2
6	14	14.3%	0.0%	14.3%	-4.9	14.3%	14.3%	28.6%	9.3
7	12	0.0%	25.0%	25.0%	-0.5	33.3%	41.7%	75.0%	0.5
8	14	0.0%	0.0%	0.0%	-17.3	28.6%	71.4%	100.0%	17.3
9	13	0.0%	15.4%	15.4%	-11.3	30.8%	53.8%	84.6%	11.3
10	11	0.0%	9.1%	9.1%	-5.2	45.5%	45.5%	90.9%	5.2
11	13	7.7%	15.4%	23.1%	5.4	38.5%	7.7%	46.2%	-18.6
12	13	0.0%	15.4%	15.4%	1.7	61.5%	15.4%	76.9%	-1.5
13	13	0.0%	7.7%	7.7%	-8.3	53.8%	38.5%	92.3%	8.3
14	13	0.0%	15.4%	15.4%	7.7	38.5%	46.2%	84.6%	-7.7
15	13	0.0%	30.8%	30.8%	9.2	46.2%	23.1%	69.2%	-9.2
16	13	0.0%	15.4%	15.4%	3.8	46.2%	38.5%	84.6%	-3.8
17	13	0.0%	23.1%	23.1%	-4.4	53.8%	23.1%	76.9%	4.4
18	13	0.0%	53.8%	53.8%	4.8	23.1%	23.1%	46.2%	-4.8
19	12	0.0%	0.0%	0.0%	-9.8	66.7%	33.3%	100.0%	9.8

Table C56. DIRECT response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.2.4 MONITOR

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	12	0.0%	8.3%	8.3%	0.8	25.0%	66.7%	91.7%	-0.8
2	12	0.0%	16.7%	16.7%	-2.2	8.3%	75.0%	83.3%	2.2
3	11	9.1%	18.2%	27.3%	-23.7	18.2%	0.0%	18.2%	-7.3
4	12	0.0%	16.7%	16.7%	-14.7	8.3%	50.0%	58.3%	-2.5
5	11	0.0%	9.1%	9.1%	-22.3	36.4%	36.4%	72.7%	8.0
6	12	0.0%	0.0%	0.0%	-19.2	25.0%	0.0%	25.0%	5.8
7	11	0.0%	9.1%	9.1%	-16.4	63.6%	27.3%	90.9%	16.4
8	12	0.0%	8.3%	8.3%	-9.0	33.3%	58.3%	91.7%	9.0
9	12	0.0%	8.3%	8.3%	-18.3	41.7%	50.0%	91.7%	18.3
10	10	0.0%	10.0%	10.0%	-4.3	50.0%	40.0%	90.0%	4.3
11	11	0.0%	18.2%	18.2%	0.5	36.4%	9.1%	45.5%	-19.3
12	11	0.0%	0.0%	0.0%	-13.7	72.7%	27.3%	100.0%	21.6
13	11	0.0%	9.1%	9.1%	-6.9	63.6%	27.3%	90.9%	6.9
14	12	0.0%	8.3%	8.3%	0.6	41.7%	50.0%	91.7%	-0.6
15	11	0.0%	9.1%	9.1%	-12.5	54.5%	36.4%	90.9%	12.5
16	12	0.0%	0.0%	0.0%	-11.5	50.0%	50.0%	100.0%	11.5
17	11	9.1%	18.2%	27.3%	-0.2	36.4%	36.4%	72.7%	0.2
18	11	27.3%	27.3%	54.5%	5.5	27.3%	18.2%	45.5%	-5.5
19	12	0.0%	0.0%	0.0%	-9.8	41.7%	58.3%	100.0%	9.8

Table C57. MONITOR response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.2.5 HIS

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	15	6.7%	6.7%	13.3%	5.8	46.7%	40.0%	86.7%	-5.8
2	15	6.7%	26.7%	33.3%	14.5	46.7%	20.0%	66.7%	-14.5
3	14	21.4%	42.9%	64.3%	13.3	21.4%	0.0%	21.4%	-4.1
4	13	7.7%	46.2%	53.8%	22.5	23.1%	23.1%	46.2%	-14.6
5	14	7.1%	50.0%	57.1%	25.8	35.7%	7.1%	42.9%	-21.8
6	15	13.3%	20.0%	33.3%	14.1	13.3%	0.0%	13.3%	-5.9
7	14	7.1%	14.3%	21.4%	-4.1	64.3%	14.3%	78.6%	4.1
8	14	28.6%	7.1%	35.7%	18.4	35.7%	28.6%	64.3%	-18.4
9	13	15.4%	38.5%	53.8%	27.2	30.8%	15.4%	46.2%	-27.2
10	14	7.1%	14.3%	21.4%	7.1	50.0%	28.6%	78.6%	-7.1
11	13	0.0%	7.7%	7.7%	-10.0	69.2%	7.7%	76.9%	12.2
12	13	7.7%	7.7%	15.4%	1.7	46.2%	15.4%	61.5%	-16.9
13	12	16.7%	8.3%	25.0%	9.0	75.0%	0.0%	75.0%	-9.0
14	14	0.0%	7.1%	7.1%	-0.5	78.6%	14.3%	92.9%	0.5
15	13	0.0%	23.1%	23.1%	1.5	76.9%	0.0%	76.9%	-1.5
16	14	0.0%	7.1%	7.1%	-4.4	57.1%	35.7%	92.9%	4.4
17	13	0.0%	38.5%	38.5%	11.0	61.5%	0.0%	61.5%	-11.0
18	13	23.1%	23.1%	46.2%	-2.9	38.5%	15.4%	53.8%	2.9
19	14	7.1%	7.1%	14.3%	4.5	50.0%	35.7%	85.7%	-4.5

Table C58. HIS response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.2.6 OTHER

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	6	0.0%	16.7%	16.7%	9.1	33.3%	50.0%	83.3%	-9.1
2	6	16.7%	16.7%	33.3%	14.5	33.3%	33.3%	66.7%	-14.5
3	6	16.7%	50.0%	66.7%	15.7	0.0%	16.7%	16.7%	-8.8
4	5	0.0%	60.0%	60.0%	28.6	0.0%	40.0%	40.0%	-20.8
5	6	0.0%	33.3%	33.3%	2.0	50.0%	16.7%	66.7%	2.0
6	6	0.0%	16.7%	16.7%	-2.6	33.3%	0.0%	33.3%	14.1
7	6	0.0%	33.3%	33.3%	7.8	33.3%	33.3%	66.7%	-7.8
8	5	20.0%	20.0%	40.0%	22.7	40.0%	20.0%	60.0%	-22.7
9	6	16.7%	16.7%	33.3%	6.7	50.0%	16.7%	66.7%	-6.7
10	6	16.7%	0.0%	16.7%	2.4	50.0%	33.3%	83.3%	-2.4
11	6	0.0%	16.7%	16.7%	-1.0	50.0%	0.0%	50.0%	-14.7
12	6	0.0%	0.0%	0.0%	-13.7	66.7%	16.7%	83.3%	4.9
13	6	16.7%	16.7%	33.3%	17.3	50.0%	16.7%	66.7%	-17.3
14	6	0.0%	0.0%	0.0%	-7.7	50.0%	50.0%	100.0%	7.7
15	6	16.7%	16.7%	33.3%	11.8	50.0%	16.7%	66.7%	-11.8
16	6	0.0%	16.7%	16.7%	5.1	33.3%	50.0%	83.3%	-5.1
17	6	0.0%	33.3%	33.3%	5.9	50.0%	16.7%	66.7%	-5.9
18	6	33.3%	50.0%	83.3%	34.3	0.0%	16.7%	16.7%	-34.3
19	6	0.0%	0.0%	0.0%	-9.8	50.0%	50.0%	100.0%	9.8

Table C59. OTHER response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.3 Responses to Measurement of Success by Respondent Position

C.10.2.3.1 BIOMED

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	14	0.0%	14.3%	14.3%	6.7	57.1%	28.6%	85.7%	-6.7
2	14	0.0%	21.4%	21.4%	2.6	50.0%	28.6%	78.6%	-2.6
3	14	7.1%	42.9%	50.0%	-1.0	35.7%	0.0%	35.7%	10.2
4	14	0.0%	35.7%	35.7%	4.3	35.7%	21.4%	57.1%	-3.6
5	14	7.1%	28.6%	35.7%	4.3	35.7%	28.6%	64.3%	-0.4
6	14	7.1%	14.3%	21.4%	2.2	28.6%	7.1%	35.7%	16.5
7	14	0.0%	42.9%	42.9%	17.4	42.9%	14.3%	57.1%	-17.4
8	14	0.0%	21.4%	21.4%	4.1	42.9%	35.7%	78.6%	-4.1
9	12	0.0%	25.0%	25.0%	-1.7	50.0%	25.0%	75.0%	1.7
10	13	0.0%	30.8%	30.8%	16.5	46.2%	23.1%	69.2%	-16.5
11	14	7.1%	7.1%	14.3%	-3.4	57.1%	7.1%	64.3%	-0.4
12	14	7.1%	14.3%	21.4%	7.7	57.1%	7.1%	64.3%	-14.1
13	14	0.0%	28.6%	28.6%	12.6	50.0%	21.4%	71.4%	-12.6
14	14	0.0%	14.3%	14.3%	6.6	57.1%	28.6%	85.7%	-6.6
15	14	0.0%	42.9%	42.9%	21.3	50.0%	7.1%	57.1%	-21.3
16	14	0.0%	21.4%	21.4%	9.9	57.1%	21.4%	78.6%	-9.9
17	14	7.1%	28.6%	35.7%	8.3	50.0%	14.3%	64.3%	-8.3
18	14	14.3%	64.3%	78.6%	29.6	14.3%	7.1%	21.4%	-29.6
19	13	0.0%	15.4%	15.4%	5.6	53.8%	30.8%	84.6%	-5.6

Table C60. BIOMED response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.3.2 IT/IS

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	3	33.3%	0.0%	33.3%	25.8	66.7%	0.0%	66.7%	-25.8
2	3	0.0%	33.3%	33.3%	14.5	66.7%	0.0%	66.7%	-14.5
3	3	33.3%	33.3%	66.7%	15.7	0.0%	0.0%	0.0%	-25.5
4	3	0.0%	66.7%	66.7%	35.3	33.3%	0.0%	33.3%	-27.5
5	3	0.0%	33.3%	33.3%	2.0	66.7%	0.0%	66.7%	2.0
6	3	0.0%	0.0%	0.0%	-19.2	0.0%	0.0%	0.0%	-19.2
7	3	33.3%	0.0%	33.3%	7.8	66.7%	0.0%	66.7%	-7.8
8	3	33.3%	0.0%	33.3%	16.0	33.3%	33.3%	66.7%	-16.0
9	3	0.0%	33.3%	33.3%	6.7	33.3%	33.3%	66.7%	-6.7
10	3	0.0%	33.3%	33.3%	19.0	33.3%	33.3%	66.7%	-19.0
11	3	0.0%	33.3%	33.3%	15.7	33.3%	0.0%	33.3%	-31.4
12	3	33.3%	0.0%	33.3%	19.6	33.3%	0.0%	33.3%	-45.1
13	3	33.3%	33.3%	66.7%	50.7	33.3%	0.0%	33.3%	-50.7
14	3	0.0%	0.0%	0.0%	-7.7	100.0%	0.0%	100.0%	7.7
15	3	0.0%	0.0%	0.0%	-21.6	100.0%	0.0%	100.0%	21.6
16	3	0.0%	0.0%	0.0%	-11.5	33.3%	66.7%	100.0%	11.5
17	3	0.0%	33.3%	33.3%	5.9	66.7%	0.0%	66.7%	-5.9
18	3	33.3%	0.0%	33.3%	-15.7	33.3%	33.3%	66.7%	15.7
19	3	33.3%	0.0%	33.3%	23.5	0.0%	66.7%	66.7%	-23.5

Table C61. IT/IS response set: Level of Agreement Indicated for various statements. See page136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.3.3 MANAGERS/DIRECTORS

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	18	0.0%	0.0%	0.0%	-7.5%	33.3%	66.7%	100.0%	7.5%
2	18	0.0%	16.7%	16.7%	-2.2%	44.4%	38.9%	83.3%	2.2%
3	16	12.5%	43.8%	56.3%	5.3%	18.8%	0.0%	18.8%	-6.7%
4	17	5.9%	29.4%	35.3%	3.9%	17.6%	35.3%	52.9%	-7.8%
5	16	6.3%	37.5%	43.8%	12.4%	12.5%	37.5%	50.0%	-14.7%
6	18	11.1%	0.0%	11.1%	-8.1%	11.1%	0.0%	11.1%	-8.1%
7	16	6.3%	6.3%	12.5%	-13.0%	62.5%	25.0%	87.5%	13.0%
8	18	5.6%	11.1%	16.7%	-0.6%	38.9%	44.4%	83.3%	0.6%
9	15	13.3%	13.3%	26.7%	0.0%	40.0%	33.3%	73.3%	0.0%
10	15	0.0%	6.7%	6.7%	-7.6%	46.7%	46.7%	93.3%	7.6%
11	16	12.5%	18.8%	31.3%	13.6%	37.5%	18.8%	56.3%	-8.5%
12	16	0.0%	0.0%	0.0%	-13.7%	75.0%	25.0%	100.0%	21.6%
13	15	0.0%	6.7%	6.7%	-9.3%	73.3%	20.0%	93.3%	9.3%
14	17	0.0%	5.9%	5.9%	-1.8%	52.9%	41.2%	94.1%	1.8%
15	16	6.3%	6.3%	12.5%	-9.1%	62.5%	25.0%	87.5%	9.1%
16	17	0.0%	11.8%	11.8%	0.2%	47.1%	41.2%	88.2%	-0.2%
17	16	0.0%	18.8%	18.8%	-8.7%	68.8%	12.5%	81.3%	8.7%
18	16	18.8%	25.0%	43.8%	-5.3%	43.8%	12.5%	56.3%	5.3%
19	17	0.0%	5.9%	5.9%	-3.9%	58.8%	35.3%	94.1%	3.9%

Table C62. MANAGERS/DIRECTORS response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.3.4 MATERIALS

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	7	0.0%	14.3%	14.3%	6.7	28.6%	57.1%	85.7%	-6.7
2	7	14.3%	14.3%	28.6%	9.7	14.3%	57.1%	71.4%	-9.7
3	7	28.6%	14.3%	42.9%	-8.1	14.3%	0.0%	14.3%	-11.2
4	6	0.0%	16.7%	16.7%	-14.7	16.7%	66.7%	83.3%	22.5
5	7	0.0%	14.3%	14.3%	-17.1	28.6%	42.9%	71.4%	6.7
6	7	14.3%	28.6%	42.9%	23.6	14.3%	0.0%	14.3%	-4.9
7	7	0.0%	28.6%	28.6%	3.1	28.6%	42.9%	71.4%	-3.1
8	6	33.3%	0.0%	33.3%	16.0	0.0%	66.7%	66.7%	-16.0
9	7	14.3%	28.6%	42.9%	16.2	0.0%	57.1%	57.1%	-16.2
10	7	14.3%	0.0%	14.3%	0.0	28.6%	57.1%	85.7%	0.0
11	7	0.0%	0.0%	0.0%	-17.6	14.3%	57.1%	71.4%	6.7
12	7	0.0%	0.0%	0.0%	-13.7	28.6%	57.1%	85.7%	7.3
13	7	14.3%	0.0%	14.3%	-1.7	28.6%	57.1%	85.7%	1.7
14	7	0.0%	0.0%	0.0%	-7.7	42.9%	57.1%	100.0%	7.7
15	7	0.0%	28.6%	28.6%	7.0	28.6%	42.9%	71.4%	-7.0
16	7	0.0%	0.0%	0.0%	-11.5	28.6%	71.4%	100.0%	11.5
17	7	0.0%	42.9%	42.9%	15.4	14.3%	42.9%	57.1%	-15.4
18	7	28.6%	28.6%	57.1%	8.1	28.6%	14.3%	42.9%	-8.1
19	7	0.0%	0.0%	0.0%	-9.8	28.6%	71.4%	100.0%	9.8

Table C63. MATERIALS response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

C.10.2.3.5 SENIOR

	Total Number of Responses	Strongly Disagree	Disagree	In Disagree-ment	Difference	Agree	Strongly Agree	In Agreement	Difference
1	9	0.0%	0.0%	0.0%	-7.5%	44.4%	55.6%	100.0%	7.5%
2	9	0.0%	11.1%	11.1%	-7.8%	44.4%	44.4%	88.9%	7.8%
3	9	11.1%	44.4%	55.6%	4.6%	0.0%	22.2%	22.2%	-3.3%
4	9	0.0%	22.2%	22.2%	-9.2%	22.2%	44.4%	66.7%	5.9%
5	9	0.0%	22.2%	22.2%	-9.2%	44.4%	33.3%	77.8%	13.1%
6	9	11.1%	11.1%	22.2%	3.0%	11.1%	11.1%	22.2%	3.0%
7	9	11.1%	11.1%	22.2%	-3.3%	33.3%	44.4%	77.8%	3.3%
8	9	0.0%	0.0%	0.0%	-17.3%	11.1%	88.9%	100.0%	17.3%
9	6	0.0%	16.7%	16.7%	-10.0%	33.3%	50.0%	83.3%	10.0%
10	9	0.0%	0.0%	0.0%	-14.3%	33.3%	66.7%	100.0%	14.3%
11	9	0.0%	11.1%	11.1%	-6.5%	55.6%	22.2%	77.8%	13.1%
12	9	11.1%	22.2%	33.3%	19.6%	22.2%	44.4%	66.7%	-11.8%
13	9	0.0%	0.0%	0.0%	-16.0%	55.6%	44.4%	100.0%	16.0%
14	9	0.0%	11.1%	11.1%	3.4%	55.6%	33.3%	88.9%	-3.4%
15	9	0.0%	11.1%	11.1%	-10.5%	66.7%	22.2%	88.9%	10.5%
16	9	0.0%	11.1%	11.1%	-0.4%	22.2%	66.7%	88.9%	0.4%
17	9	0.0%	22.2%	22.2%	-5.2%	55.6%	22.2%	77.8%	5.2%
18	9	11.1%	11.1%	22.2%	-26.8%	55.6%	22.2%	77.8%	26.8%
19	9	0.0%	11.1%	11.1%	1.3%	55.6%	33.3%	88.9%	-1.3%

Table C64. SENIOR response set: Level of Agreement Indicated for various statements. See page 136 for a list of numbered statements. Absolute Number and Percentage Distribution of responses on strongly disagree-strongly agree scale for each given statement. See page 137 for an explanation of the 'Difference' columns.

Appendix D – Questionnaire

D.1.1 Survey – English Version

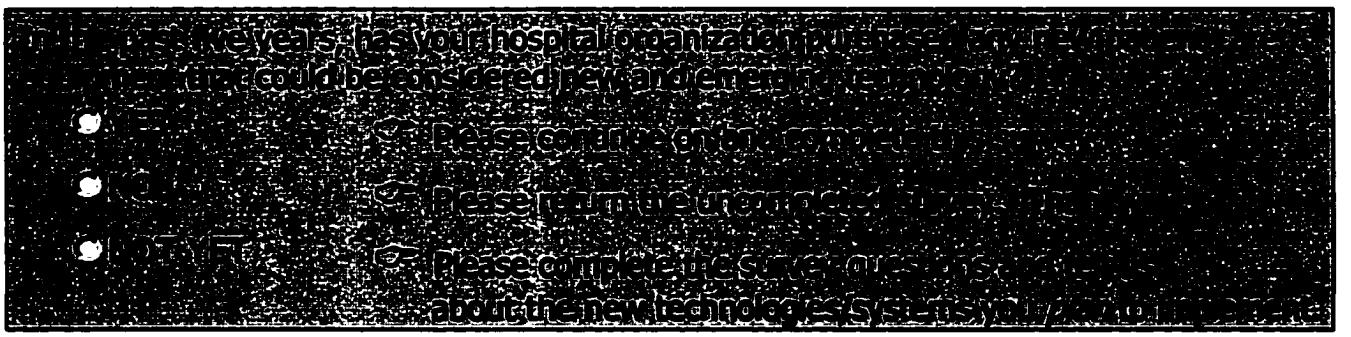
Technology Assessment in Canadian Hospitals

Is your hospital:

☐ a Teaching Hospital? ☐ a Community Hospital?

Number of Beds:

○ < 100 ○ 100 - 250 ○ 250+



Please note that this survey addresses the broad process of technology acquisition and does not focus solely on equipment issues. The aim is to explore evaluation methods involved in the assessment of new and emerging technologies, not simply the implicated apparatus considerations.

With regard to the new and emerging technologies you have implemented within the past five years or plan to implement –

When: _____

What system(s): _____

What driving factors contributed to the acquisition of this new technology?

_____

_____

_____

_____

New and Emerging Technology:

Process of Assessment / Implementation

Process of Assessment **When your organization acquires new and emerging technology, which of the following stakeholders does it involve in the assessment process? To what extent?** ***→ Please shade in or place a check mark in the appropriate circle below to indicate the extent of involvement (on a scale of 1-4 where 1 is lowest and 4 is highest); select N/A (not applicable) if the stakeholder is/was not involved at all.***						**Implementation** ***→ Please place a check mark next to the stakeholders whose greater involvement would have been beneficial during the assessment/selection process and explain HOW/WHY.***
Stakeholder	**Extent of Involvement:** LOW → HIGH 1	2	3	4	N/A	
Allied Health	○	○	○	○	○	☐
Biomedical/Clinical Engineers	○	○	○	○	○	☐
Board of Directors	○	○	○	○	○	☐
Community	○	○	○	○	○	☐
Information Technologists	○	○	○	○	○	☐
Lab	○	○	○	○	○	☐
Management: Operational* *includes Financial, Facilities Support, etc.	○	○	○	○	○	☐
Management: Senior	○	○	○	○	○	☐
Manufacturers	○	○	○	○	○	☐
Nurses	○	○	○	○	○	☐
Patients	○	○	○	○	○	☐
Physicians	○	○	○	○	○	☐
Support Services	○	○	○	○	○	☐
Technology Officers (Equipment Users)	○	○	○	○	○	☐
Other (please specify) _____	○	○	○	○	○	☐

Please state your position within the organization and your role with regard to the assessment and incorporation of new technology into the hospital environment.

_____

_____

With regard to the acquisition process in general, do you feel that you are sufficiently consulted and/or that your expertise and contributions are optimally employed? Please comment.

○ YES ○ NO

_____

_____

In what additional ways would you have liked to have been involved, or wish to be involved in future? How would your involvement have been, or be, of benefit?

_____

_____

How important were the following factors to the evaluation process?
→ Please shade in or place a check mark in the appropriate circle below to indicate the level of importance (on a scale of 1-4 where 1 is lowest and 4 is highest).

Factor	**Level of Importance:** LOW → HIGH 1 2 3 4
Cost	○ ○ ○ ○
Ergonomics/User Friendliness	○ ○ ○ ○
Infection Control	○ ○ ○ ○
IT/IS Interconnections	○ ○ ○ ○
Legal Information/Standards	○ ○ ○ ○
Master Facility Plan of Hospital/Existing Space	○ ○ ○ ○
Potential to Improve Patient Care	○ ○ ○ ○
Security and Safety	○ ○ ○ ○
Service Contracts	○ ○ ○ ○

Equipment Considerations

Following assessment of your new and emerging technology requirements, did you consider the following? What level of importance did you place on each?
→ Please shade in or place a check mark in the appropriate circle below to indicate the level of importance (on a scale of 1-4 where 1 is lowest and 4 is highest).

	Level of Importance: LOW → HIGH 1 2 3 4	Please provide further explanation and/or numerical data if applicable (e.g. number of different vendors, types of options considered).
Various Vendors	○ ○ ○ ○	
Various Service Providers	○ ○ ○ ○	
Disposability Considerations	○ ○ ○ ○	
Expandability	○ ○ ○ ○	
Parts	○ ○ ○ ○	
Product Options	○ ○ ○ ○	
Service Agreements	○ ○ ○ ○	
Training Requirements	○ ○ ○ ○	
Upgrade Paths	○ ○ ○ ○	
Other (please specify) _____	○ ○ ○ ○	
Other (please specify) _____	○ ○ ○ ○	

Implementation of New and Emerging Technology

Please provide information regarding new and emerging technology programs, which your hospital has implemented, or will be implementing:

Technology Name and Brief Description	Equipment	Who are the users? How many are there?	Is this technology meeting expectations? How so? If NOT → Why not? Which stakeholders' involvement could have avoided the problem? What equipment considerations could have avoided the problem?	Implementation Strategy	Please select the appropriate circle below to indicate the extent to which technology and equipment capabilities are being realized to full capacity. **Partial Use → 100% Capability** **1 2 3 4**
				○ Immediate ○ Phased-In	Technology: ○ ○ ○ ○ Equipment: ○ ○ ○ ○
				○ Immediate ○ Phased-In	Technology: ○ ○ ○ ○ Equipment: ○ ○ ○ ○
				○ Immediate ○ Phased-In	Technology: ○ ○ ○ ○ Equipment: ○ ○ ○ ○
				○ Immediate ○ Phased-In	Technology: ○ ○ ○ ○ Equipment: ○ ○ ○ ○
				○ Immediate ○ Phased-In	Technology: ○ ○ ○ ○ Equipment: ○ ○ ○ ○

Did you encounter any unforeseen circumstances during the implementation phase?

		YES	NO
Any unforeseen:	Costs?	○	○
	Renovations?	○	○
	Additional Purchases?	○	○
	Staffing Requirements?	○	○
	Required Supplies?	○	○
	Time Required for Installation?	○	○
	Training Requirements?	○	○

Please comment.

_____

_____

_____

New and Emerging Technology – Measurement of Success

→ ***Please indicate your level of agreement with the following statements by selecting (placing a check mark or shading in) the appropriate circle below. Scale of 1-4: 1 corresponds to 'Strongly Disagree' and 4 corresponds to 'Strongly Agree'; select N/A in cases of non-applicability.***	STRONGLY DISAGREE → STRONGLY AGREE 1	2	3	4	N/A
The new technology has met with high levels of success in the hospital.	○	○	○	○	
Patient care has improved substantially as a result of the implementation of the new/emerging technology.	○	○	○	○	
Anticipated cost savings have been realized.	○	○	○	○	○
Time savings are significant: for the patient.	○	○	○	○	○
: for the user/technician.	○	○	○	○	○
Noise reduction has been achieved in patient care areas.	○	○	○	○	○
Administrative staff satisfaction is high.	○	○	○	○	
Physician/Surgeon satisfaction is high.	○	○	○	○	
Nurse satisfaction is high.	○	○	○	○	
User satisfaction is high.	○	○	○	○	
Service Contracts meet expectations.	○	○	○	○	○
The supplier tailored the system to meet the needs of our organization.	○	○	○	○	○
The supplier provided adequate training and supportive resources.	○	○	○	○	
The technology is easy to use.	○	○	○	○	
The technology is easy to maintain.	○	○	○	○	
The system is reliable.	○	○	○	○	
The assessment process met all of our needs.	○	○	○	○	
No complications arose during implementation and expectations were met.	○	○	○	○	
We recommend the technology to others.	○	○	○	○	

Do you notice a difference in patient care pre- versus post- incorporation of new and emerging technologies in your particular hospital environment? What is the greatest contribution these technologies have made?

_____

_____

_____

If possible, what would you change and/or improve regarding the new/emerging technologies –

a) the equipment itself?

_____

_____

_____

b) the assessment/acquisition process?

_____

_____

_____

c) implementation (e.g. installation, training, etc.)?

_____

_____

_____

ADDITIONAL NOTES – If you require additional space to further explain any answers, which you have provided – or, if you wish to make additional comments, please use the space below.

Thank you!

Optional: If you wish to further discuss any issues by telephone, please contact me or provide me with your contact information so that I may call you. Please note that in any case, strict confidentiality and anonymity will be maintained.
Contact information: _____
Best time to call: _____

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D.1.2 Survey – French Version

Évaluation de technologie dans les hôpitaux canadiens

Est-ce que vôtre hôpital
☐ est un hôpital d'enseignement? ☐ est un hôpital communautaire?

Nombres de lits?
☐ < 100 ☐ 100 à 250 ☐ 250 >

Remarquez que ce questionnaire concerne en gros le processus d'acquisition de technologie en général et non seulement sur les considérations d'équipement. Le but est de rechercher les méthodes d'évaluation des technologies nouvelles et émergentes, non seulement des considérations d'équipement.

Par rapport aux technologies nouvelles et émergentes que vous avez mises en oeuvre depuis les derniers cinq ans, ou que vous planifiez exécuter:

Quand? _____

Quel(s) système(s)?

_____

Quel(s) élément(s) important(s) ont contribué à l'acquistion de cette (ces) technologie(s) nouvelle(s)?

_____

_____

_____

_____

Technologie nouvelle et émergente:
Processus d'évaluation / Processus de mise en œuvre

Processus d'évaluation **Quand l'hôpital acquiert la technologie nouvelle et émergente, *lesquels des participants suivants implique-t-il dans le processus d'évaluation ? Dans quelle mesure?*** ***→Choisissez un nombre de un à quatre ci-dessous pour indiquer la mesure de participation au processus. Le 1 correspond au niveau le plus bas et 4 correspond au niveau le plus haut; choisissez N/A (non applicable) si le participant n'est pas impliqué du tout.***						**Processus de mise en œuvre** ***→ Cochez lesquels des participants dont la plus grande contribution c'est avéré avantageuse pendant l'évaluation et expliquez pourquoi et comment.***
Participants	**Mesure de participation:** BAS → HAUT 1	2	3	4	N/A	
Personnel paramédical	○	○	○	○	○	☐
Ingénieurs biomédicals/cliniques	○	○	○	○	○	☐
Conseil d'administration	○	○	○	○	○	☐
Communauté	○	○	○	○	○	☐
Technologues d'information	○	○	○	○	○	☐
Labo	○	○	○	○	○	☐
Gestion opérationnelle* * inclut finances, l'appui d'équipements, etc.	○	○	○	○	○	☐
Gestion supérieure	○	○	○	○	○	☐
Fabricants	○	○	○	○	○	☐
Infirmiers(es)	○	○	○	○	○	☐
Patients	○	○	○	○	○	☐
Médecins	○	○	○	○	○	☐
Services de soutien	○	○	○	○	○	☐
Techniciens (Utilisateurs d'équipements)	○	○	○	○	○	☐
Autres (spécifez s'il vous plaît) _____	○	○	○	○	○	☐

Spécifiez votre poste dans l'hôpital et décrivez votre rôle en ce qui concerne l'évaluation et l'incorporation de nouvelle technologie dans l'hôpital.

_____

_____

Par rapport au processus d'acquisition de technologie en général, estimez-vous qu'on vous consulte suffisamment et que votre expertise et contributions sont utilisées de façon optimale? Inscrivez vos remarques. ☐OUI ☐NON

_____

_____

En quelles voies complémentaires auriez-vous aimé avoir été impliqués ou voudriez-vous être impliqués à l'avenir? Comment votre participation aura-t-elle été bénéfique et l'est telle maintenant?

_____

_____

Quel fut le degré d'importance des facteurs suivants dans le processus d'évaluation?

→ Choisissez un nombre de un à quatre ci-dessous pour indiquer le niveau d'importance de chaque facteur; 1 correspond au niveau le plus bas et 4 correspond au niveau le plus haut.

Facteur	**Niveau d'importance:** BAS → HAUT 1 2 3 4
Coût	○ ○ ○ ○
Ergonomie/convivialité	○ ○ ○ ○
Contrôle d'infection	○ ○ ○ ○
Technologie de l'information	○ ○ ○ ○
Légalités et standardisation	○ ○ ○ ○
Plan d'architecture principal de l'hôpital et l'espace actuel	○ ○ ○ ○
Potentiel pour améliorer les soins aux patients	○ ○ ○ ○
Sûreté et sécurité	○ ○ ○ ○
Contrats d'entretien	○ ○ ○ ○

Considérations de l'équipement

Après l'évaluation de la technologie nouvelle et émergente, avez-vous considéré les éléments suivants? Quel niveau d'importance avez-vous placé sur chacun?

→ Choisissez un nombre de un à quatre ci-dessous pour indiquer le niveau d'importance de chaque élément; 1 correspond au niveau le plus bas et 4 correspond au niveau le plus haut.

	Niveau d'importance: BAS → HAUT 1 2 3 4	Expliquez davantage ou fournissez les données numériques si applicable (par exemple le nombre de vendeurs différents, les types de choix considérés, etc.)
Differents vendeurs	○ ○ ○ ○	
Divers fournisseurs de services	○ ○ ○ ○	
Facilité de recyclage, etc.	○ ○ ○ ○	
Potentiel d'expansion	○ ○ ○ ○	
Pièces	○ ○ ○ ○	
Produits optionels	○ ○ ○ ○	
Accords de service	○ ○ ○ ○	
Formations requises	○ ○ ○ ○	
Possibilité de mise à jour	○ ○ ○ ○	
Autre (spécifiez s'il vous plaît) _____	○ ○ ○ ○	
Autre (spécifiez s'il vous plaît) _____	○ ○ ○ ○	

Mise en oeuvre de technologie nouvelle et émergente

Fournissez l'information quant aux programmes de technologie nouvelle et émergente que votre hôpital a mis en oeuvre, ou mettra en oeuvre.

Technologie Nom et brève description	Équipement	Qui sont les utilisateurs et combien sont déjà là?	Cette technologie rencontre-t-elle vos attentes? Comment? Si NON → Pourquoi pas? Quels sont les participants qui pourraient avoir évité le problème? Quelles études d'équipement pourraient avoir évité le problème?	Quelle est la stratégie de mise en oeuvre de technologie?	Choisissez un nombre de un à quatre ci-dessous pour indiquer la mesure à laquelle la technologie et les capacités d'équipement sont compris à pleine capacité. **Utilisation Partielle → Utilisation de Total** **1 2 3 4**
				❍ Immédiate ❍ Progressive	Technologie: ❍ ❍ ❍ ❍ Équipement: ❍ ❍ ❍ ❍
				❍ Immédiate ❍ Progressive	Technologie: ❍ ❍ ❍ ❍ Équipement: ❍ ❍ ❍ ❍
				❍ Immédiate ❍ Progressive	Technologie: ❍ ❍ ❍ ❍ Équipement: ❍ ❍ ❍ ❍
				❍ Immédiate ❍ Progressive	Technologie: ❍ ❍ ❍ ❍ Équipement: ❍ ❍ ❍ ❍
				❍ Immédiate ❍ Progressive	Technologie: ❍ ❍ ❍ ❍ Équipement: ❍ ❍ ❍ ❍

Avez-vous rencontré des circonstances imprévues pendant la phase de mise en oeuvre de technologie:

		OUI	NON
Quel imprévu en:	Dépenses?	○	○
	Rénovations?	○	○
	Achats complémentaires?	○	○
	Exigences de personnel?	○	○
	Provisions Exigées?	○	○
	Temps exigé pour installation?	○	○
	Exigences de formation ?	○	○

Remarques s'il y a lieu.

Technologie nouvelle et émergente – Mesure de succès

→ Indiquez votre niveau d'accord avec les déclarations suivantes en choisissant le nombre approprié de un à quatre ci-dessous où 1 correspond à 'fortement pas d'accord' et 4 correspond à 'fortement d'accord'; choisissez N/A dans les cas de non-applicabilité.	FORTEMENT PAS D'ACCORD → FORTEMENT D'ACCORD 1	2	3	4	N/A
La nouvelle technologie a rencontré un haut niveau de succès à l'hôpital.	○	○	○	○	
Le soin aux patients s'est amélioré considérablement suite à la mise en oeuvre de la nouvelle/émergente technologie.	○	○	○	○	
Les économies de coût prévues ont été réalisés.	○	○	○	○	○
Les économies de temps sont significatives : pour le patient.	○	○	○	○	○
: pour l'utilisateur/technicien.	○	○	○	○	○
La réduction du bruit a été atteinte dans des secteurs de soin aux patients.	○	○	○	○	○
La satisfaction du personnel administratif est élevée.	○	○	○	○	
La satisfaction du médecin/chirurgien est élevée.	○	○	○	○	
La satisfaction des infirmiers(es) est élevée.	○	○	○	○	
La satisfaction des utilisateurs est élevée.	○	○	○	○	
Les contrats de sevice répondent aux attentes.	○	○	○	○	○
Le fournisseur a façonné le système pour répondre aux besoins de notre organisation.	○	○	○	○	○
Le fournisseur a fourni la formation adéquate et des ressources positives.	○	○	○	○	
La technologie est facile à utiliser.	○	○	○	○	
La technologie est facile d'entretien.	○	○	○	○	
Le système est fiable.	○	○	○	○	
Le processus d'évaluation a rencontré tous nos besoins.	○	○	○	○	
Aucune complication n'est survenue pendant la mise en oeuvre et les attentes furent rencontrées.	○	○	○	○	
Nous recommandons la technologie aux autres.	○	○	○	○	

Remarquez-vous une différence dans le soin aux patients avant et après l'incorporation de technologies nouvelles et émergentes dans votre hôpital particulier? Quelle est la contribution la plus importante que ces technologies ont apporté?

Si possible, que changeriez-vous et amélioreriez-vous quant aux nouvelles technologies

d) En ce qui concernce l'équipement?

_____

_____

_____

e) En ce qui concerne le processus d'évaluation/d'acquisition?

_____

_____

_____

f) En ce qui concernce la mise en oeuvre (par exemple installation, formation, etc)?

_____

_____

_____

NOTES COMPLÉMENTAIRES - Si vous avez besoin d'espace supplémentaire pour mieux expliquer les réponses que vous avez fournies - ou, si vous veulez faire des commentaires additionnels, utilisez l'espace ci-dessous.

Merci!

Facultatif: si vous voulez discuter en plus des questions par téléphone, entrez s'il vous plaît en contact avec moi ou fournissez-moi votre information de contact pour que je puisse vous appeler. Notez qu'en tout cas, la confidentialité stricte et l'anonymat seront maintenus.

Information de contact :_____

le Meilleur temps d'appeler: _____

Narissa Dudar
l'Institut des matériaux biologiques et d'ingénierie biomédicale, l'Université de Toronto
n.dudar@utoronto.ca
l'Hôpital Régional Humber River: 416-249-8111, 4394

D. 2 Cover Letters Used in Survey Dissemination

D.2.1 Conventional Mail

D.2.1.1 President and/or CEO Contact Information Known

August 30, 2001

«Prefix» «FirstName» «LastName»
«Title»
«Hospital»
«Address»
«City», «Province» «PostalCode»

Dear «Prefix» «LastName»:

I am a graduate student working towards a Master's Degree in Clinical Engineering at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. I am in the process of doing internship and thesis work at the Humber River Regional Hospital. My thesis research pertains to the role of technology analysis, assessment, and implementation with regard to new and emerging hospital technologies. My interests lie in understanding and applying the mechanisms required to enhance and maintain the quality of Canadian health care.

The incorporation of leading edge technology in the health care sector can have dramatic effects. Improved patient care, increased satisfaction – on the parts of health care providers and patients – as well as enhanced organizational efficiency are among the number of favoured outcomes.

Technology assessment is a critical need for Canadian hospitals. Our aim is to understand and hopefully better the process, while playing a role in its expansion and formalization. To this end, we have created a questionnaire regarding experience with new and emerging diagnostic and treatment capabilities. This survey is entirely anonymous. We ask for your assistance in this endeavour: please provide your personal insight and share your experience. If you would prefer to respond to an electronic version of this questionnaire, please send e-mail to **n.dudar@utoronto.ca**. We have enclosed three copies of the survey; we ask that you complete one yourself and distribute the others as you see fit. We would like to obtain responses from as many hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, and Director of Clinical/Biomedical Engineering – as possible.

We sincerely appreciate any information, which you may provide and wish to express our gratitude for your effort and cooperation in taking the time to assist us, and hopefully the state of healthcare in Canada. Thank you very much for your valuable contribution!!

Sincerely,

Narissa Dudar

D.2.1.2 President and/or CEO Contact Information Unknown

August 30, 2001

President and CEO
«Hospital»
«Address»
«City», «Province» «PostalCode»

Dear Sir or Madam:

I am a graduate student working towards a Master's Degree in Clinical Engineering at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. I am in the process of doing internship and thesis work at the Humber River Regional Hospital. My thesis research pertains to the role of technology analysis, assessment, and implementation with regard to new and emerging hospital technologies. My interests lie in understanding and applying the mechanisms required to enhance and maintain the quality of Canadian health care.

The incorporation of leading edge technology in the health care sector can have dramatic effects. Improved patient care, increased satisfaction – on the parts of health care providers and patients – as well as enhanced organizational efficiency are among the number of favoured outcomes.

Technology assessment is a critical need for Canadian hospitals. Our aim is to understand and hopefully better the process, while playing a role in its expansion and formalization. To this end, we have created a questionnaire regarding experience with new and emerging diagnostic and treatment capabilities. This survey is entirely anonymous. We ask for your assistance in this endeavour: please provide your personal insight and share your experience. If you would prefer to respond to an electronic version of this questionnaire, please send e-mail to **n.dudar@utoronto.ca**. We have enclosed three copies of the survey; please direct these to the appropriate individuals within your organization. We would like to obtain responses from as many hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, and Director of Clinical/Biomedical Engineering – as possible.

We sincerely appreciate any information, which you may provide and wish to express our gratitude for your effort and cooperation in taking the time to assist us, and hopefully the state of healthcare in Canada. Thank you very much for your valuable contribution!!

Sincerely,

Narissa Dudar

D.2.1.3 Cover Letter for Unspecified Others within Organization

August 30, 2001

«Hospital»
«Address»
«City», «Province» «PostalCode»

Dear Sir or Madam:

I am a graduate student working towards a Master's Degree in Clinical Engineering at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. I am in the process of doing internship and thesis work at the Humber River Regional Hospital. My thesis research pertains to the role of technology analysis, assessment, and implementation with regard to new and emerging hospital technologies.
The incorporation of leading edge technology in the health care sector can have dramatic effects. Improved patient care, increased satisfaction – on the parts of health care providers and patients – as well as enhanced organizational efficiency are among the number of favoured outcomes.

Technology assessment is a critical need for Canadian hospitals. Our aim is to understand and hopefully better the process, while playing a role in its expansion and formalization. To this end, we have created a questionnaire regarding experience with new and emerging diagnostic and treatment capabilities. This survey is entirely anonymous. We ask for your assistance in this endeavour: please provide your personal insight and share your experience. If you would prefer to respond to an electronic version of this questionnaire, please send e-mail to **n.dudar@utoronto.ca**. We would like to obtain responses from as many hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, and Director of Clinical/Biomedical Engineering – as possible.

We sincerely appreciate any information, which you may provide. Thank you for your effort and cooperation in taking the time to assist us, and hopefully the state of healthcare in Canada.

Thank you very much for your valuable contribution!!

Sincerely,

Narissa Dudar

D.2.1.4 President and/or CEO Contact Information Known – French Version

le 5 septembre 2001

«Prefix» «FirstName» «LastName»
«Title»
«Hospital»
«Address»
«City», «Province» «PostalCode»

«Prefix» «LastName»,

J'étudie pour obtenir une maîtrise en ingénierie clinique à l'Institut des matériaux biologiques et d'ingénierie biomédicale à l'Université de Toronto. Je prépare une thèse à l'université et à l'Hôpital Régional Humber River. Ma recherche concerne le rôle d'analyse, d'évaluation, et de la mise en oeuvre des technologies nouvelles et émergentes dans les hôpitaux canadiens. Je m'intéresse à l'application des procédés et des mécanismes exigés pour augmenter et maintenir la qualité des services médicaux canadiens.

L'incorporation de la technologie avançée dans le secteur des services médicaux peut avoir des effets bénifiques. Parmi les résultats favorisés sont l'amélioration du soin aux patients, l'augmentation de la satisfaction des fournisseurs de services médicaux et des patients, et la création d'une organisation efficace.

Les hôpitaux canadiens ont besoin de l'évaluation de technologie. Notre but est de comprendre et améliorer ce processus, en particpant à son expansion et formation. Pour accomplir ceci, nous avons élaboré un questionnaire quant aux expériences avec les éléments de traitement et de diagnostics nouveaux et émergents. Cette enquête est entièrement confidentielle! Aidez-nous s'il vous plaît: fournissez-nous votre point de vue et partagez votre expérience à «Hospital».

Nous avons inclus trois copies du questionnaire: remplissez une copie vous-même et distribuez les autres copies à votre discrétion. Nous voudrions obtenir des réponses du personnel de votre hôpital - particulièrement ceux dans la capacité de Président/PDG, du Directeur des achats et du Directeur d'ingénierie Clinique/Biomédicale. Si vous préférez répondre à une version électronique de ce questionnaire, envoyez par courrier électronique à **n.dudar@utoronto.ca**.

Nous apprécions sincèrement toute information pertinente que vous serez en mesure de fournir, nous vous remercions de votre effort et coopération. Vous nous aiderez et vous contribuerez à améliorer l'état des soins au Canada.

Sincèrement,

Narissa Dudar

D.2.1.5 President and/or CEO Contact Information Unknown – French Version

le 5 septembre 2001

PDG
«Hospital»
«Address»
«City», «Province» «PostalCode»

Monsieur ou Madame,

J'étudie pour obtenir une maîtrise en ingénierie clinique à l'Institut des matériaux biologiques et d'ingénierie biomédicale à l'Université de Toronto. Je prépare une thèse à l'université et à l'Hôpital Régional Humber River. Ma recherche concerne le rôle d'analyse, d'évaluation, et de la mise en oeuvre des technologies nouvelles et émergentes dans les hôpitaux canadiens. Je m'intéresse à l'application des procédés et des mécanismes exigés pour augmenter et maintenir la qualité des services médicaux canadiens.

L'incorporation de la technologie avançée dans le secteur des services médicaux peut avoir des effets bénifiques. Parmi les résultats favorisés sont l'amélioration du soin aux patients, l'augmentation de la satisfaction des fournisseurs de services médicaux et des patients, et la création d'une organisation efficace.

Les hôpitaux canadiens ont besoin de l'évaluation de technologie. Notre but est de comprendre et améliorer ce processus, en particpant à son expansion et formation. Pour accomplir ceci, nous avons élaboré un questionnaire quant aux expériences avec les éléments de traitement et de diagnostics nouveaux et émergents. Cette enquête est entièrement confidentielle! Aidez-nous s'il vous plaît: fournissez-nous votre point de vue et partagez votre expérience à «Hospital».

Nous avons inclus trois copies du questionnaire: remplissez une copie vous-même et distribuez les autres copies à votre discrétion. Nous voudrions obtenir des réponses du personnel de votre hôpital - particulièrement ceux dans la capacité de Président/PDG, du Directeur des achats et du Directeur d'ingénierie Clinique/Biomédicale. Si vous préférez répondre à une version électronique de ce questionnaire, envoyez par courrier électronique à **n.dudar@utoronto.ca**.

Nous apprécions sincèrement toute information pertinente que vous serez en mesure de fournir, nous vous remercions de votre effort et coopération. Vous nous aiderez et vous contribuerez à améliorer l'état des soins au Canada.

Sincèrement,

Narissa Dudar

D.2.1.6 Cover Letter for Unspecified Others within Organization – French Version

le 5 septembre 2001

«Hospital»
«Address»
«City», «Province» «PostalCode»

Monsieur ou Madame:

J'étudie pour obtenir une maîtrise en ingénierie clinique à l'Institut des matériaux biologiques et d'ingénierie biomédicale à l'Université de Toronto. Je prépare une thèse à l'université et à l'Hôpital Régional Humber River. Ma recherche concerne le rôle d'analyse, d'évaluation, et de la mise en oeuvre des technologies nouvelles et émergentes dans les hôpitaux canadiens. Je m'intéresse à l'application des procédés et des mécanismes exigés pour augmenter et maintenir la qualité des services médicaux canadiens.

L'incorporation de la technologie avançée dans le secteur des services médicaux peut avoir des effets bénifiques. Parmi les résultats favorisés sont l'amélioration du soin aux patients, l'augmentation de satisfaction des fournisseurs de services médicaux et des patients, et la création d'une organisation efficace.

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Nous apprécions sincèrement toute information pertinente que vous serez en mesure de fournir, nous vous remercions de votre effort et coopération. Vous nous aiderez et vous contribuerez à améliorer l'état des soins au Canada.

Sincèrement,

Narissa Dudar

D.2.2 Electronic Mail

D.2.2.1 President and/or CEO Contact Information Known

Dear «Prefix» «LastName»:

I am a graduate student at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto working towards a Master's Degree in Clinical Engineering. My thesis research pertains to the role of technology analysis, assessment, and implementation with regard to new and emerging hospital technologies. My interests lie in understanding and applying the mechanisms required to enhance and maintain the quality of Canadian health care.

The incorporation of leading edge technology in the health care sector can have dramatic effects. Improved patient care, increased satisfaction – on the parts of health care providers and patients – as well as enhanced organizational efficiency are among the number of favored outcomes.

Technology assessment is a critical need for Canadian hospitals. My aim is to understand and hopefully better the process, while playing a role in its expansion and formalization. To this end, I have created a questionnaire regarding experience with new and emerging diagnostic and treatment capabilities. This survey is entirely confidential! I ask for your assistance in this endeavour: please provide your personal insight and share your experience as «Title» at «Hospital».

Please complete this survey yourself and forward this e-mail to others as you see fit. I would like to obtain responses from as many hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, and Director of Clinical/Biomedical Engineering – as possible. If you would prefer to respond to a hard copy version of this questionnaire, please reply to this e-mail and provide your mailing address so that I may send a paper form survey to you.

I sincerely appreciate any information, which you may provide and wish to express my gratitude for your effort and cooperation in taking the time to assist me, and hopefully the state of healthcare in Canada. Thank you very much in advance for your valuable contribution!!

Sincerely,

Narissa Dudar

D.2.2.2 President and/or CEO Contact Information Unknown

Dear Sir or Madam:

I am a graduate student at the Institute of Biomaterials and Biomedical Engineering at the University of Toronto working towards a Master's Degree in Clinical Engineering. My thesis research pertains to the role of technology analysis, assessment, and implementation with regard to new and emerging hospital technologies. My interests lie in understanding and applying the mechanisms required to enhance and maintain the quality of Canadian health care.

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Technology assessment is a critical need for Canadian hospitals. My aim is to understand and hopefully better the process, while playing a role in its expansion and formalization. To this end, I have created a questionnaire regarding experience with new and emerging diagnostic and treatment capabilities. This survey is entirely anonymous! I ask for your assistance in this endeavour: I seek insight into the experience at «Hospital».

Please complete this survey yourself, if appropriate, and forward this e-mail to others as you see fit. I would like to obtain responses from as many hospital personnel – particularly those in the capacity of President/CEO/COO, Executive Director, Director of Purchasing, and Director of Clinical/Biomedical Engineering – as possible. If you would prefer to respond to a hard copy version of this questionnaire, please reply to this e-mail and provide your mailing address so that I may send a paper form survey to you.

I sincerely appreciate any information, which you may provide and wish to express my gratitude for your effort and cooperation in taking the time to assist me, and hopefully the state of healthcare in Canada. Thank you very much in advance for your valuable contribution!!

Sincerely,

Narissa Dudar

D.2.2.3 President and/or CEO Contact Information Known – French Version

[English text follows]

«Prefix» «LastName»:

J'étudie pour obtenir une maîtrise en ingénierie clinique à l'Institut des Matériaux biologiques et d'ingénierie biomédicale à l'Université de Toronto. Ma thèse concerne le rôle d'analyse, d'évaluation, et de la mise en oeuvre des technologies nouvelles et émergentes dans les hôpitaux canadiens. Je m'intéresse à l'application des procédés et des mécanismes exigés pour augmenter et maintenir la qualité des services médicaux canadiens.

L'incorporation de la technologie avançée dans le secteur des services médicaux peut avoir des effets bénifiques. Parmi les résultats favorisés sont l'amélioration du soin aux patients, l'augmentation et la satisfaction des fournisseurs de services médicaux et des patients, et la création d'une organisation efficace.

Les hôpitaux canadiens ont besoin de l'évaluation de technologie. Mon but est de comprendre et améliorer ce processus, en particpant à son expansion et formation. Pour accomplir ceci, j'ai élaboré un questionnaire quant aux expériences avec les éléments de traitement et de diagnostics nouveaux et émergents. Cette enquête est entièrement confidentielle! Aidez-moi s'il vous plaît: fournissez-moi votre point de vue et partagez votre expérience à «Hospital».

Remplissez ce questionnaire vous-même et expédiez-le par courrier électronique aux autres comme vous jugerez utile. Je voudrais obtenir des réponses du personnel de votre hôpital - particulièrement ceux dans la capacité de Président/PDG, du Directeur des achats et du Directeur d'ingénierie Clinique/Biomédicale. Si vous préférez répondre à une version imprimé de ce questionnaire, répondez à ce courrier électronique et fournissez votre adresse postale.

J'apprécie sincèrement toute information pertinente que vous serez en mesure de fournir, je vous remercie de votre effort et coopération. Vous m'aiderez et vous contrburez à améliorer l'état des soins au Canada.

Sincèrement,
Narissa Dudar

D.2.2.4 President and/or CEO Contact Information Unknown – French Version

[English text follows]

Monsieur ou Madame:

J'étudie pour obtenir une maîtrise en ingénierie clinique à l'Institut des Matériaux biologiques et d'ingénierie biomédicale à l'Université de Toronto. Ma thèse concerne le rôle d'analyse, d'évaluation, et de la mise en oeuvre des technologies nouvelles et émergentes dans les hôpitaux canadiens. Je m'intéresse à l'application des procédés et des mécanismes exigés pour augmenter et maintenir la qualité des services médicaux canadiens.

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Les hôpitaux canadiens ont besoin de l'évaluation de technologie. Mon but est de comprendre et améliorer ce processus, en particpant à son expansion et formation. Pour accomplir ceci, j'ai élaboré un questionnaire quant aux expériences avec les éléments de traitement et de diagnostics nouveaux et émergents. Cette enquête est entièrement confidentielle! Aidez-moi s'il vous plaît à rechercher l'expérience à «Hospital».

Remplissez ce questionnaire vous-même si c'est applicable et expédiez-le par courrier électronique aux autres comme vous jugerez utile. Je voudrais obtenir des réponses du personnel de votre hôpital - particulièrement ceux dans la capacité de Président/PDG, du Directeur des achats et du Directeur d'ingénierie Clinique/Biomédicale. Si vous préférez répondre à une version imprimé de ce questionnaire, répondez à ce courrier électronique et fournissez votre adresse postale.

J'apprécie sincèrement toute information pertinente que vous serez en mesure de fournir, je vous remercie de votre effort et coopération. Vous m'aiderez et vous contrburez à améliorer l'état des soins au Canada.

Sincèrement,
Narissa Dudar

D.3. Mailing List Distribution Details

D.3.1 Composition of Mailing List Table – Number of Hospital Records

	English Only		Bilingual		TOTAL: English+Bilingual	
Known Contact Name						
CEO						
Individual entry associated with that CEO	158		60		218	
Multiple entries associated with that CEO	121		11		132	
CEO Total:		279		71		350
Non-CEO		0		0		0
Known Contact Name Total:		279		71		350
Unknown Contact Name		16		50		66
TOTAL: Conventional Mail		295		121		416
Known Contact Name						
CEO						
Individual entry associated with that CEO	28		7		35	
Multiple entries associated with that CEO	12		0		12	
CEO Total:		40		7		47
Non-CEO						
Individual entry associated with that individual	34		9		43	
Multiple entries associated with that individual	2		0		2	
Non-CEO Total:		36		9		45
Known Contact Name Total:		76		16		92
Unknown Contact Name						
General hospital enquiries						
Individual hospital associated with that address	56		28		84	
Multiple hospitals associated with that address	12		5		17	
Unknown Contact Name Total:		68		33		101
TOTAL: Electronic Mail		144		49		193
[redacted]						

Table D1. Number of records in Hospital Mailing List database table by specified characteristics.

D.3.2 Provincial Composition of Questionnaire Recipients

	Attempted Sends				Unsuccessful Attempts				(Assumed) Successful Distribution						
	Electronic Mail		Conventional Mail		Electronic Mail		Conventional Mail		*Electronic Mail*			*Conventional Mail*			TOTAL
PROVINCE	Bil	Eng	Bil	Eng	Bil	Eng	Bil	Eng	Bilingual	English	Total	Bilingual	English	Total	
AB	0	14	0	54	0	1	0	1	0	13	13	0	53	53	66
BC	0	17	0	67	0	2	0	2	0	15	15	0	65	65	80
MB	0	10	0	13	0	2	0	0	0	8	8	0	13	13	21
NB	6	0	0	5	0	0	0	0	6	0	6	0	5	5	11
NF	0	10	0	14	0	0	0	1	0	10	10	0	13	13	23
NS	0	5	0	10	0	0	0	1	0	5	5	0	9	9	14
NT	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1
ON	0	80	0	114	0	4	0	0	0	76	76	0	114	114	190
PE	0	0	0	5	0	0	0	0	0	0	0	0	5	5	5
QC	43	0	121	0	18	0	1	0	25	0	25	120	0	120	145
SK	0	8	0	11	0	0	0	0	0	8	8	0	11	11	19
YT	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1
Total:	49	144	121	295	18	9	1	5	31	135	166	120	290	410	576

Table D2. Number of Questionnaires Distributed by Province

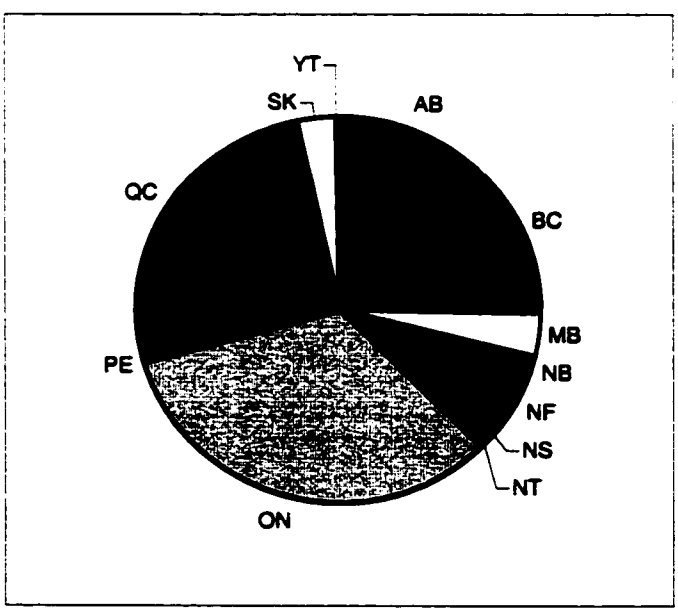

Figure D1. Provincial Distribution of (Assumed) Successful Survey Dissemination

Appendix E – Resources

A number of resources exist to assist in the process of HTA. These supportive services provide information on the practice of HTA, and in some cases (either for a fee: a particular price per report or a subscription cost; or free of charge) also offer to carry out the procedure for specific technologies under individual clients' consideration. Examples of HTA resources include, but are not limited to, the following organizations. All of the Internet addresses provided below are available as of March 2002.

E.1 International Organizations

International Network of Agencies for Health Technology Assessment (INAHTA)

http://www.inahta.org/

- Established in 1993; based in Sweden; holds annual meetings
- Currently comprised of 37 members* in 19 different countries
- Goal: provide a forum for cooperation and the sharing of HTA information among different cultures
- Provides a searchable database of publications and research projects and provides web links to member agencies

International Society for Technology Assessment in Health Care (ISTAHC)

ISTAHC
P.O Box 1390
Montréal (QC) H3B 3L2

http://www.istahc.org/

- Established in 1985 as "an international, multilingual forum for researchers and clinicians working for scientifically-based assessment of the expanding range of technologies in healthcare, including drugs, devices, medical and surgical procedures, as well as organizational, administrative and support systems"
- A non-profit organization serving as "an international forum for those concerned with evaluation of health technology"
- Function: encouragement of global dissemination of assessment information and support of education and research in HTA

* INAHTA member agencies listed in this document are marked with an asterisk

World Health Organization (WHO) Technology Assessment and Quality Assurance

http://www.who.int/pht/technology_assessment/

- Goals: encouragement of "leadership and coordination in the field of technology assessment and quality assurance" by means of establishing a network of international and national agencies to "provide technical and other support to countries in this programme area"; promotion of "the importance of technology assessment and quality assurance in expanding health services – especially at the primary health care level – in a cost-effective and acceptable manner"
- Examples of Collaborating Centres:
    - WHO Collaborating Centre for Health Policy and Technological Development – Campinas, Brazil
    - WHO Collaborating Centre for Health Technology Assessment – Ontario, Canada
    - WHO Collaborating Centre for Essential Technologies in Health – Tygerberg, South Africa
    - WHO Collaborating Centre – ECRI
    - WHO Collaborating Center for Health Technology Assessment – Medical Technology and Practice Patterns Institute (MTPPI)

E.2 Asia and the Pacific

E.2.1 Australia

***Australian Safety and Efficacy Register of New Interventional Procedures – Surgical (ASERNIP-S)**

PO Box 688
North Adelaide SA 5006
Tel: (08) 8239 1144; Fax: (08) 8239 1244

http://www.surgeons.org/open/asernip-s.htm

- Administered by the Royal Australian College of Surgeons (RACS)
- Goal: provision of timely high quality "assessments of new and emerging surgical technologies and techniques"
- Targets: surgeons, health care providers and consumers, both national and international

***Medical Services Advisory Committee (MSAC)**

MSAC Secretariat
Department of Health and Aged Care
MDP 107
GPO Box 9848
CANBERRA ACT 2601
Tel: +61 2 6289 6811; Fax: +61 2 6289 8799

http://www.msac.gov.au/

- Founded under the auspices of the 1997-1998 budget, which announced a mandate to improve "health outcomes for patients by ensuring that new and existing medical

procedures attracting Medicare benefits are supported by scientific evidence as being safe, clinically effective and cost effective"
- Goal: provision of information and advice to the Australian Minister for Health and Aged Care regarding "safety, effectiveness and cost-effectiveness of new medical technologies and procedures"

E.2.2 New Zealand

***New Zealand Health Technology Assessment (NZHTA)**

NZHTA
Christchurch School of Medicine
PO Box 4345
Christchurch, New Zealand
Tel/Fax: (03) 364 1152

http://nzhta.chmeds.ac.nz/

- Established at the Department of Public Health and General Practice at the Christchurch School of Medicine in 1995
- Contract partners: The Health Funding Authority (HFA) and the Ministry of Health
- Serves as "Clearing House for Health Outcomes and Health Technology Assessment"
- Goal: identification of "effective health care interventions and technologies and thereby facilitate evidence-based policy making and purchasing by the New Zealand funders of health and disability services"

E.3 Western Hemisphere – North America

E.3.1 Canada

*** ^ Canadian Coordinating Office for Health Technology Assessment (CCOHTA)**

110-955 Green Valley Crescent
Ottawa, ON Canada K2C 3V4
Tel: (613) 226-2553; Fax: (613) 226-5392

http://www.ccohta.ca/

- Established as a non-profit corporation in 1989 by a coalition of provincial and territorial ministers of health; in 1993, a review of its operations resulted in its establishment as a permanent organization
- Mandate: to "encourage the appropriate use of health technology by influencing decision makers through the collection, analysis, creation and dissemination of information concerning the effectiveness and cost of technology and its impact on health"
- Goal: facilitation of "information exchange, resource pooling and the coordination of priorities for health technology assessments"

The Canadian Health Technology Assessment Network (CHTAN)
(on CCOHTA website: http://www.ccohta.ca/newweb/links.asp)

- Goal: development and maintenance of a "systematic, effective and efficient programme of government-funded health technology assessment in Canada"
- "Membership to this network is available to organizations managing a structured programme of assessing health technologies (procedures, devices, drugs, etc.). The organization must receive the majority of its funding from provincial, territorial and/or federal governments(s), and the principal objective of the structured programme must be to generate and/or provide information on health technologies for use in administrative or clinical decision making"

E.3.1.1 Alberta

*** ^ Alberta Heritage Foundation for Medical Research (AHFMR)**

Suite 1500
10104 – 103 Avenue
Edmonton, AB T5J 4A7
Tel: (780)423-5727; Fax: (780)429-3509

http://www.ahfmr.ab.ca/

- Established in 1980 by an Act of Legislature and an endowment of $300 million; operates under the Health Research Collaboration between the provincial Health Ministry and the Alberta Heritage Foundation

The Health Technology Assessment Unit:

- Functions: evaluation of characteristics and effects of new health care technologies; provision of "information to support all health care decisions at local, regional, national, and international levels"
- Responds to requests from organizations and individuals

E.3.1.2 British Columbia

^ The British Columbia Office of Health Technology Assessment (BCOHTA)
at the Centre for Health Services & Policy Research

Centre for Health Services & Policy Research
429 - 2194 Health Sciences Mall
Vancouver, BC V6T 1Z3
Tel: (604) 822-4810; Fax: (604) 822-5690

http://www.chspr.ubc.ca/bcohta/

- Established in 1990 and funded fully by the BC Ministry of Health & Ministry Responsible for Seniors; based at the University of British Columbia
- Function: promotion of HTA research
- With the electronic library resources of the University of British Columbia at its disposal, the office provides literature searches encapsulating "informal technology

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CHTA Network members are identified by a ^ symbol

assessment reports, technical reports, consensus statements, task force reports, and other fugitive information not easily accessed through more traditional sources"

E.3.1.3 Manitoba

^ Manitoba Centre for Health Policy (MCHP)

http://www.umanitoba.ca/centres/mchp/

- A research unit in the Faculty of Medicine at the University of Manitoba that investigates "the way health care services are used by Manitobans" by evaluating illness patterns, determinants of health, and health care utilization

E.3.1.4 Ontario

^ Institute for Clinical and Evaluative Sciences (ICES)

Room G1 06
2075 Bayview Avenue
Toronto, ON M4N 3M5
Tel: (416) 480-4055; Fax: (416) 480-6048

http://www.ices.on.ca/

- Established in 1992 as an independent, non-profit organization
- Functions: development and dissemination of "information and decisions-tools to policymakers, administrators, clinical-managers, practitioners, and patients"; execution of "health services research in the areas of clinical and policy relevance from a population-wide perspective"

E.3.1.5 Québec

*** ^ Agence d'évaluation des technologies et des modes d'intervention en santé (AETMIS) - Agency for Health Services and Technology Assessment**

Agency for Health Services and Technology Assessment
2021, avenue Union, bureau 1040
Montréal (Québec) H3A 2S9
Tel.: (514) 873-2563; Fax.: (514) 873-1369

http://www.aetmis.gouv.qc.ca/en/index.htm

- Established by the Government of Québec in 1988 with a four-year mandate, which was renewed indefinitely in 1992; currently reports to the Minister of Research, Science and Technology
- Goals: "promoting and supporting health technology assessment, disseminating the results of the assessment and encouraging their use in decision making by all stakeholders involved in the diffusion of these technologies"; "advising the Minister on matters concerning the introduction, diffusion and use of health care technologies and, to this end, giving advice based on the assessment of their effectiveness, safety and cost, their impact on the health-care system, and their economic, ethical and social implications"

- Targets: "all stakeholders in the health-care system, whether they be the general population, as consumers of health-care services, the care-givers or the managers of health-care services"

E.3.1.6 Saskatchewan

^ Health Services Utilization and Research Commission (HSURC)

Health Services Utilization and Research Commission
Box 46 103 Hospital Drive
Saskatoon, SK S7N 0W8
Tel: (306) 655-1500; Fax: (306) 655-1462

http://www.hsurc.sk.ca/

- Established in 1992 by the province, this provincial health research grant regulation agency is also an "arm's-length, government-funded agency with a mandate to assess Saskatchewan's health system and make recommendations for evidence-based change"
- One of its directives involves the study of "effectiveness of health procedures, practices, and technologies"

E.3.2 United States

***Agency for Healthcare Research and Quality (AHRQ)**
formerly the Agency for Health Care Policy and Research (AHCPR)

http://www.ahcpr.gov/

- This health services research organization is affiliated with the U.S. Department of Health and Human Services (HHS)
- Functions: assistance of the biomedical research mission of its sister agency, the National Institutes of Health (NIH); support (by means of funding and provision of technical assistance) of health services research at U.S. universities and institutions; development (in partnership with the public and private sectors) of a knowledge base to guide health policymaking
- Research specialties include: "quality improvement and patient safety"; "outcomes and effectiveness of care"; "clinical practice and technology assessment"; "health care organization and delivery systems"

Health Services Technology Assessment Texts (HSTAT)

http://hstat.nlm.nih.gov/

- A "free, web-based resource that provides access to full-text documents useful for providing health information and for health care decision making"
- Function: promotion of use of HTA in Denmark; provision of information, advice, education and training
- Targets: health care providers, researchers, policy makers, payers, and consumers in addition to the professional groups, which serve the above

Center for Practice and Technology Assessment

http://www.ahrq.gov/about/cpta/cptafact.htm

- Established November 1997
- Serves as a vehicle through which the AHRQ "helps to narrow the gap between what is known from research about effective and efficient clinical care and what is practiced in health care settings"
- Function: support of Evidence-based Practice Centers, the National Guideline Clearinghouse™, the U.S. Preventive Services Task Force promotion of use of HTA in Denmark; provision of information, advice, education and training

ECRI's Health Technology Assessment Information Service (HTAIS)

http://www.ecri.org/Products_Frameset.asp?FrameSource=446447.htm&Bookmark=HealthTechnologyAssessmentInformationService

- Provides "Comprehensive Technology Assessment Reports", "Windows on Medical Technology™", and its proprietary "Health Technology Assessment Databases"
- "provides broad access to technology assessment information and research results"
- "reports are widely considered to be the gold standard for technology assessment by constituencies throughout the healthcare community worldwide"; "have been used by law- and policymakers, as well as departments and Ministries of Health around the world to guide national and regional health policy"
- Designated by the AHRQ as an Evidence-based Practice Center (EPC)

National Information Center on Health Services Research and Health Care Technology (NICHSR)

http://www.nlm.nih.gov/nichsr/nichsr.html

- Created in 1993 at the National Library of Medicine by the NIH Revitalization Act
- Goal: improvement in "the collection, storage, analysis, retrieval, and dissemination of information on health services research, clinical practice guidelines, and on health care technology, including the assessment of such technology"
- Works in conjunction with AHRQ
- Targets: health practitioners, health care administrators, health policy makers, payers, and the IT professionals serving these groups

NIH Consensus Development Program

http://odp.od.nih.gov/consensus/

- NIH's Office of Medical Applications of Research uses this program to coordinate major conferences that result in technology assessment statements on controversial medical issues

***Veterans Affairs Technology Assessment Program (VA TAP)**

http://www.va.gov/vatap/

- A national program established in 1994
- Function: policymaking assistance regarding "'what works' in health care by carrying out systematic reviews of the medical literature on health care technologies"

E.3.2.1 Massachusetts

Program on the Economic Evaluation of Medical Technology (PEEMT)

Harvard Centre for Risk Analysis
718 Huntington Avenue
Boston, MA 02115-5924
Tel: (617)432-4497; Fax: (617)432-0190

http://www.hcra.harvard.edu/medical.html

- Goal: provision of information regarding the clinical and economic implications of various medical technologies to enhance informed decision making

E.3.2.2 Washington, DC

Medical Technology & Practice Patterns Institute (MTTPI)

http://www.mtppi.org/frameset.asp?Pg=/&MI=1

- Established in 1986 as a nonprofit organization to "conduct research on the clinical, economic, and social implications of new and emerging health care technologies"
- Its research "is directed toward the formulation and implementation of local and national health care policies"
- Collaborates with "numerous governmental agencies, medical professional associations, medical industry and provider organizations...many other research groups, including academic institutions and international health organizations"

E.4 Europe

E.4.1 Central Europe

E.4.1.1 Hungary

***The Unit of Health Economics and Health Technology Assessment (HunHTA)**

- Established in April 2001 as a part of the Department of Public Policy and Management, Budapest University of Economic Sciences and Public Administration
- Goal: provision of health economics and HTA education and training to students and healthcare professionals to establish an appropriate HTA infrastructure and pool of trained professionals

E.4.2 Western Europe

E.4.2.1 Austria

***Institut Für Technikfolgen-Abschätzung (ITA) – Institute of Technology Assessment**

Strohgasse 45, 5
A-1030 Vienna
Tel: 0043-1-710 25 10-6582; Fax: 0043-1-710 98 83

http://www.oeaw.ac.at/ita/hta/

- Founded January 1994 as a research facility of the Austrian Academy of Sciences (AAS); funded by the AAS and third parties (e.g. Austrian Fund for Scientific Research, Commission of the European Union, various Austrian Ministries)
- "performs inter-disciplinary scientific research at the interface of technology and society"

E.4.2.2 Denmark

***Danish Centre for Evaluation and Health Technology Assessment (DACEHTA)**

National Board of Health
Islands Brygge 67, P.O. Box 1881
DK-2300 Copenhagen S, Denmark
Tel: +4572227400; Fax: +4572227413

as of March 2002, website still under construction; however, website for DIHTA (see below) exists: http://www.dihta.dk/

- Formed by merger of the Danish Institute of Health Technology Assessment (DIHTA) and the Danish Hospital Evaluation Centre in April 2001
- Function: execution of HTAs and integration of HTA-principles into management and planning of all levels of public health service
- Targets: healthcare professionals, decision-makers, researchers

Danish Institute of Health Technology Assessment (DIHTA)

- Founded in 1997 under the initiative of the Ministry of Health
- Function: promotion of use of HTA in Denmark; provision of information, advice, education and training
- Target: public

***DSI Danish Institute for Health Services Research**

P.O. Box 2595, Dampfaergevej 22
DK – 2100 Copenhagen Denmark
Tel: + 45 35 39 84 00; Fax: + 45 35 29 84 99

http://www.dsi.dk/engelsk.html

- Offers research information, consultation, and planning expertise about health sector services

E.4.2.3 Finland

***Finnish Office for Health Technology Assessment (FinOHTA)**

http://www.stakes.fi/finohta/

- In cooperation with the National Research and Development Centre for Welfare and Health, it produces, supports and coordinates HTA in Finland and distributes national and international assessment findings
- Goal: "promote the use of proper evidence-based methods in the Finnish health care system in order to enhance the effectiveness and impact of health care"
- Targets: "all professional groups in health care, political decision-makers and the general public"

E.4.2.4 France

***L'Agence Nationale d'Accréditation et d'Evaluation en Santé (ANAES)**

http://www.anaes.fr

- Goal: assessment of the knowledge base, which bridges evidence-based medicine and healthcare practices in the fields of diagnosis, prevention, therapy, and biotechnology

***Comité d'Evaluation et de Diffusion des Innovations Technologiques (CEDIT)**

Direction de la Politique Médicale
Service des Activités Médico-Techniques
3, Avenue Victoria
75 100 Paris RP – FRANCE
Tel: (33) 1.40.27.31.09; Fax: (33) 1.40.27.55.65

http://cedit.aphp.fr/

- Created in 1982, this is a hospital-based agency, which makes use of international data in assessing medical technology and providing decisions support to the CEO of the Assistance Publique-Hôpitaux de Paris (AP-HP) "on the opportunity, extent and mode of diffusion of technological innovations in AP-HP hospitals"
- Does not provide information on pharmaceuticals; limited to other diagnosis and treatment devices and procedures

E.4.2.5 Germany

***DAHTA @ DIMDI – German Scientific Working Group of Technology Assessment in Health Care (DAHTA) at the German Institute for Medical Documentation and Information (DIMDI)**
Deutsches Institut für Medizinische Dokumentation und Information (DIMDI)

Waisenhausgasse 36 – 38 a, D-50676 Köln
Tel: +49 (0) 221 / 47 24 – 1; Fax: +49 (0) 221 / 47 24 – 4 44

http://www.dimdi.de/homeeng.htm

- Operating under the German Federal Ministry of Health, DIMDI was established in 1969

- Goal: "provide the interested public with quick and easy access to the latest information in all fields of the life sciences"
- DAHTA manages a national HTA project database and examines "the transferability of results of HTAs from abroad to Germany"

E.4.2.6 Netherlands

***College voor Zorgverzekeringen (CVZ)**

1183 AT Amstelveen
Postbus 396
1180 BD Amstelveen
Tel: (020) 34 75 555; Fax: (020) 64 73 494

http://www.cvz.nl/

- Goal: improvement of health insurance and financing system and guaranteeing accessibility and appropriateness of health services
- Function: performance of HTA of novel and established technologies

Department of Medical Technology Assessment (MTA)

University Medical Centre Nijmegen
Department of Medical Technology Assessment (253 MTA)
P.O. Box 9101
NL – 6500 HB Nijmegen
the Netherlands
Tel: +31-24-3610389; Fax: +31-24-3610383

http://www.ehm.kun.nl/mta/home.htm

- Functions in collaboration with numerous departments at the University Hospital Nijmegen St Radboud and the Faculty of Medical Sciences of the University of Nijmegen
- Functions: performance of research involving "various aspects of health technology assessment, in particular economic evaluation, quality-of-life assessment, implementation research, and ethical evaluation"; also execute a great number of theoretical studies into "the philosophy of science and technology, and evaluation methodology"

***TNO – The Netherlands Organization for Applied Scientific Research**

Tel: +31 15 269 69 69; Fax +31 15 261 24 03

http://www.tno.nl/en/about/index.html

- An independent contract research organization, partly government funded
- Goal: contribution to the application of technology in health care

***Gezondheidsraad (GR) – Health Council of the Netherlands**


http://www.gr.nl/

- Publishes reports, which are available to the public
- "provides the Dutch government with objective, scientific advice on a great variety of questions relating to individual and collective health care in the broadest sense, including e.g. environmental issues"

***ZonMW – NWO The Netherlands Organization for Scientific Research**


Postbus 93138
2509 AC Den Haag


http://www.nwo.nl/NWOHome.nsf/Index

- Originally founded as the Netherlands Organization for the Advancement of Pure Research (ZWO) over half a century ago
- Encourages and seeks to improve scientific research at Dutch universities and research institutes
- "committed to ensuring that the level of the research carried out in the Netherlands is and remains among the highest in the world"
- Promotes scientific cooperation at an international level

E.4.2.7 Norway

***Senter for medisinsk metodevurdering (SMM) – Norwegian Center for Health Technology Assessment**


SMM, SINTEF Unimed
P.O.box 124 Blindern
0314 OSLO Norway
Tel: + 47 22 06 79 61; Fax: + 47 22 06 79 79


http://www.oslo.sintef.no/smm/

- Established and funded by the Norwegian Ministry of Health and Social Affairs in 1997
- Conducts systemic reviews of novel and established technologies to "critically review the scientific basis for methods used in health care and to evaluate their costs, risks and benefits"
- "concerned with weeding out ineffective technologies, and ensuring that approved technologies are applied as efficiently as possible"
- Targets: "policy-makers, health care providers and patients / consumers"

E.4.2.8 Spain

***Agencia Evaluación Tecnologías Sanitarias (AETS), Instituto de Salud Carlos III – Health Technology Assessment Agency, Carlos III Health Institute**


http://www.isciii.es/unidad/aet/caet.html

- Identifies health technology, supports training on the proper use of HT, produces assessment reports on HT for the public and also for internal purposes (in response to specific requests)

***Agencia Evaluación Tecnologías Sanitarias de Andalucía (AETSA)**

http://www.csalud.junta-andalucia.es/orgdep/AETSA/default.htm

- Created in 1996 by the Government of Andelucia
- Goal: promotion of evidence-based medicine and analysis of cost-effectiveness

***Agència d'Avaluació de Tecnologia i Recerca Mèdiques (AATM)**
Catalan Agency for Health Technology Assessment (CAHTA)

http://www.aatm.es/

- Created in 1994 as a successor to the Catalan Office for Health Technology Assessment (COHTA) (created in 1991); non-profit agency affiliated with the Catalan Health Service
- Provides trilingual products, services, publications, and information about international activities
- Goal: encouragement of "introduction, adoption, diffusion and utilization of health technologies according to proven scientific criteria of efficacy, safety, effectiveness and efficiency, while promoting the needs assessment and equity analysis in the delivery and financing of health care services"
- Targets: "planners, financiers, purchasers, providers, professionals in charge of teaching and research programmes, users"

E.4.2.9 Sweden

***Statens Beredning För Medicinsk Utvärdering (SBU) –**
The Swedish Council on Technology Assessment in Health Care

SBU, P. O. Box 5650, S-114 86 Stockholm, Sweden
Tel: +46-8-412 32 00; Fax: +46-8-411 32 60

http://www.sbu.se/admin/index.asp

- Originally founded in 1987 as a working committee in the Ministry of Health; became a permanent agency in 1992 due to its success
- Goal: critical appraisal of healthcare methods and the objective assessment of the related costs, risks, benefits, and social and ethical ramifications
- Assessment of new and existent methods

Centrum för utvärdering av medicinsk teknologi (CMT) –
Center for Medical Technology Assessment

CMT
Department of Health and Society
Linköping University
S – 581 83 LINKOPING
SWEDEN
Tel: +46 13 22 20 00; Fax: +46 13 22 49 95

http://ghan.imt.liu.se/CMT/English/Engstartsida.html

- Established in 1984 by the President of Linköping University, with funding from the County Council of Östergötland; currently (as of January 2002) associated with the Department of Health and Society (IHS) at Linköping University
- Goal: execute medical technology assessments in the context of medical, social, economic and ethical issues

E.4.2.10 Switzerland

Swiss Network for Health Technology Assessment (SNHTA)

http://www.snhta.ch/

- Founded in June 1999
- Goals: promotion of HTA research; "to gather, exchange and disseminate information, expertise and reports"; "to avoid double track work through cooperation in order to make optimal use of limited resources available for HTA"; "to cooperate in international HTA-networks and projects"; "at a later stage, to pool the Swiss HTA-expertise of all members in order to realize joint Swiss HTA-projects"

***Medical Technology Unit – Federal Social Insurance Office Switzerland (MTU-FSIOS)**

Federal Social Insurance Office Switzerland
Medical Technology Unit / MTU of FSIOS
Effingerstrasse 20
CH - 3003 Berne
Switzerland
Tel: ++41-31-322 15 86; Fax: ++41-31-322 78 80

http://www.bsv.admin.ch

- Established over twenty years ago; currently "Switzerland's leading institution in HTA for decision-making"
- Functions: "review new procedures and procedures which have to be considered as 'contestable or controversial' in terms of their clinical effectiveness, appropriateness and efficiency" and present findings to the Federal Commission for General Health Insurance Benefits, and following that to the Swiss Minister of Home Affairs

***Technology Assessment – Swiss Science Council**

Centre for TA at the Swiss Science and Technology Council
Birkenweg 61
CH-3003 Bern
Tel: +41-31-322 99 63; Fax: +41-31-323 36 59

http://www.ta-swiss.ch/

- Goal: timely evaluation of consequences and assessment and minimization of possible negative effects of technology

E.4.2.11 United Kingdom

Centre for Health Economics (CHE)

Centre for Health Economics
University of York
Heslington
YORK, UK YO10 5DD
Tel: 01904 433718; Fax: 01904 433644

http://www.york.ac.uk/inst/che/

- A specialist health economics research group at the University of York, founded in 1983
- Functions: "economic evaluation of health technologies"; "outcome measurement"; "primary care"; "addiction and health promotion"; "health economics in low and middle income countries"; "resource allocation"; "health policy"

Health Economics Research Group (HERG)

HERG, Brunel University, Uxbridge, UK, UB8 3PH
Tel: +44 (0)1895 203331; Fax: +44 (0)1895 203330

http://http1.brunel.ac.uk/departments/herg/

- Established nearly twenty years ago
- Function: economic evaluation of a broad range of clinical and health service technologies and the provision of "applied, policy-relevant research"

Health Services Research Unit (HSRU)

Medical School · University of Aberdeen · Foresterhill
Aberdeen AB25 2ZD
Tel: +44 (0)1224-553909; Fax: +44 (0)1224-663087

http://www.abdn.ac.uk/hsru/

- Guided by a national remit to investigate the optimal means of health care provision and to provide research methods training to health services professionals
- Provides health care assessment research in addition to other research programs

***Health Technology Board for Scotland (HTBS)**

Health Technology Board for Scotland
Delta House
50 West Nile Street
Glasgow, UK G1 2NP
Tel: (+44) (0)141 225 6999; Fax: (+44) (0)141 248 3778

http://www.htbs.co.uk/home.asp?did=6

- "works to improve Scotland's health by providing evidence-based advice to NHSScotland on the clinical and cost effectiveness of new and existing health technologies"
- Primary function: HTA

***The National Coordinating Centre for Health Technology Assessment (NCCHTA)**

Mailpoint 728, Boldrewood
University of Southampton
Bassett Crescent East
SOUTHAMPTON
SO16 7PX
Tel: 023 8059 5586; Fax: 023 8059 5639

http://www.hta.nhsweb.nhs.uk/
http://www.ncchta.org

- Goal: ensure availability of high quality scientific data regarding the value of health technologies; provide these data to those who make use of, or are employed by, the National Health Service (NHS)
- Offers HTA overview information, news, publications, details of research in progress, facts about priority research fields; also provides a form for site visitors to offer suggestions regarding potential technologies for evaluation
- Targets: medical professionals

***NHS Centre for Reviews and Dissemination (NHSCRD)**

NHS Centre for Reviews and Dissemination
University of York
York, UK
YO10 5DD
Tel: 01904 434555; Fax: 01904 433661

http://www.york.ac.uk/inst/crd/

- "established in January 1994 to provide the NHS with important information on the effectiveness of treatments and the delivery and organization of health care"
- Provides comprehensive and systematic appraisals of selected topics
- Produces an HTA database including projects and publications:

Health Technology Assessment (HTA) Database
http://nhscrd.york.ac.uk/htahp.htm

- Produced in collaboration with INAHTA secretariat
- The website offers abstracts regarding ongoing technology assessment projects and publications detailing completed HTAs

***The National Horizon Scanning Centre (NHSC)**

http://www.publichealth.bham.ac.uk/horizon/

- Located at the University of Birmingham
- Function: provision of "advance notice of significant new and emerging health technologies to the United Kingdom's Department of Health"

***The National Institute for Clinical Excellence (NICE)**

National Institute for Clinical Excellence
11 Strand
London
WC2N 5HR
Tel: 020 7766 9191; Fax: 020 7766 9123

http://www.nice.org.uk/

- Established in April 1999 as a Special Health Authority for England and Wales
- A component of the National Health Service (NHS)
- Functions: "provide patients, health professionals and the public with authoritative, robust and reliable guidance on current 'best practice'"; "the guidance will cover both individual health technologies (including medicines, medical devices, diagnostic techniques, and procedures) and the clinical management of specific conditions"
- Targets: offers two different portals from the main website: one for "patient/public", the other for "professional"