Rapid Synthesis

Examining Capital Acquisition Models for Advanced Diagnostic Imaging

24 February 2017

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Rapid Synthesis:
Examining Capital Acquisition Models for Advanced Diagnostic Imaging
10-day response

24 February 2017

McMaster Health Forum

For concerned citizens and influential thinkers and doers, the McMaster Health Forum strives to be a leading hub for improving health outcomes through collective problem solving. Operating at regional/provincial levels and at national levels, the Forum harnesses information, convenes stakeholders, and prepares action-oriented leaders to meet pressing health issues creatively. The Forum acts as an agent of change by empowering stakeholders to set agendas, take well-considered actions, and communicate the rationale for actions effectively.

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Timeline

Rapid syntheses can be requested in a three-, 10- or 30-business day time frame. This synthesis was prepared over a 10-business day time frame. An overview of what can be provided and what cannot be provided in each of the different timelines is provided on the McMaster Health Forum's Rapid Response program webpage.

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Conflict of interest

The authors declare that they have no professional or commercial interests relevant to the rapid synthesis. The funder played no role in the identification, selection, assessment, synthesis or presentation of the research evidence profiled in the rapid synthesis.

Merit review

The rapid synthesis was reviewed by a small number of policymakers, stakeholders and researchers in order to ensure its scientific rigour and system relevance.

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KEY MESSAGES

Questions

- What models can be used for capital acquisition of advanced diagnostic imaging equipment?
- What are the economic impacts of the identified models for capital acquisition?

Why the issue is important

- The need to control financial resources in the health sector is constraining capital investments, which requires decision-makers to ensure that models used to make costly investments in technology and equipment meet their needs.
- This challenge is particularly acute in acquiring, replacing and maintaining advanced diagnostic imaging equipment, which has been subject to an increase in demand over the past decade.
- Careful management of this process prior to replacing equipment can improve the efficacy and safety of services, reduce costs and ensure that the equipment can deliver needed clinical services.
- In addition to these challenges, purchasing or leasing of diagnostic imaging equipment is frequently decentralized to hospitals to make decisions for their institution or region.
- Identifying the best available evidence is important to determine the most efficient and effective mechanisms for managing the procurement and acquisition of medical imaging equipment.

What we found

- We identified a total of eight relevant documents addressing (at least in part) one or more of the questions, including five primary studies, one environmental scan, one thesis and one book chapter.
- From these we identified three models – purchase, lease and managed equipment service contracts – that could be used for capital acquisition of advanced diagnostic imaging equipment.
- Purchasing equipment was found to be advantageous as compared to leasing when the equipment is known to have a long lifespan (e.g., seven years) and has limited opportunity to become technically obsolete in the foreseeable future, however, leasing was found to be advantageous when institutions require greater amounts of flexibility or are unable to provide the necessary capital.
- Literature on managed equipment service contracts detailed their potential benefits, including budgetary certainty, managed risks for equipment maintenance, and ready access to expertise and technical knowledge of operating the equipment.
- An environmental scan of processes for diagnostic imaging equipment replacement and upgrade across Canada found that decisions to replace or upgrade equipment follow similar processes across provinces, with most engaging in five-year budgeting cycles for renewing technologies (exceptions being B.C., which uses a 15-month cycle, and Alberta, which favours a three-year cycle), and using contingency funds for emergency replacement.
- Limited literature was identified on the economic impacts of these capital acquisition models, but one article and one net present value analysis were found and provide mixed results on purchasing or leasing a CT scanner.

QUESTIONS

- What models can be used for capital acquisition of advanced diagnostic imaging equipment?
- What are the economic impacts of the identified models for capital acquisition?

WHY THE ISSUE IS IMPORTANT

Total expenditure on health and long-term care is rising across Canada and is predicted to continue rising over the next decade.(1) The increased need for public resources to be allocated to this sector is straining government budgets and represents a major area of public concern.(1) This strain is felt at all levels of the health system, including in hospitals where, as a result of wear and tear, technology progress and changes in clinical practice, decision-makers are tasked with prioritizing equipment to be upgraded or replaced.(2) Upgrading this equipment, however, is often a costly process. Careful management prior to replacing this equipment can improve the efficacy and safety of services, reduce costs and ensure that the equipment can deliver needed clinical services.(2)

This challenge of acquiring, replacing and maintaining equipment is particularly acute in the area of diagnostic imaging, which has been subject to an increase in demand over the past decade, and has led to a focus by federal, provincial and territorial governments to reduce wait times in priority areas such as diagnostics.(1) For example, in 2012 Canadians underwent 1.7 million magnetic resonance imaging (MRI) exams and 4.4 million computed tomography exams (CT). This represents nearly double the number of exams performed in 2003.(3) Further complicating the replacement or acquisition of new technology is that current processes for purchasing or leasing diagnostic imaging equipment across Canada are often decentralized to hospitals to make decisions for their institution or their region.

Box 1: Background to the rapid synthesis

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the McMaster Health Forum's Rapid Response program. Whenever possible, the rapid synthesis summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

Rapid syntheses can be requested in a three-, 10- or 30-business-day time frame. An overview of what can be provided and what cannot be provided in each of these timelines is provided on the McMaster Health Forum's Rapid Response program webpage (http://www.mcmasterhealthforum.org/policymakers/rapid-response-program)

This rapid synthesis was prepared over a 10-business day time frame and involved four steps:

1) submission of a question from a health system policymaker or stakeholder;
2) identifying, selecting, appraising and synthesizing relevant research evidence about the question;
3) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence; and
4) finalizing the rapid synthesis based on the input of at least two merit reviewers.

Given this context, there is a need to determine the most efficient and effective mechanisms for managing the procurement and acquisition of medical imaging equipment. In this rapid synthesis requested by the British Columbia Ministry of Health, we sought to identify research evidence examining capital acquisition models and their economic impacts as they relate to diagnostic imaging.

WHAT WE FOUND

We identified a total of eight relevant documents addressing (at least in part) one or more of the questions, including five primary studies, one environmental scan, one thesis and one book chapter. We provide more details about each of the single studies in Appendix 2.

Question 1 – What models can be used for capital acquisition of advanced diagnostic imaging equipment?

Four primary studies, a thesis, an environmental scan and a book chapter were found that either directly or indirectly addressed this question. It should be noted that in searching for research evidence, additional reviews and studies were found that relate to this question (particularly with regards to leasing advanced diagnostic imaging equipment), but were primarily conducted in the late 1980s and early 1990s.(4-12) Due to large changes in technology and in the cost of this equipment, it was determined that the findings from this evidence would no longer be applicable in today's context and were therefore excluded from this synthesis.

The included literature identified purchasing, leasing and managed equipment service contracts as three different models for acquiring advanced diagnostic imaging equipment. Apart from one study, the literature did not compare the identified models, but rather focused on considerations for purchasing diagnostic imaging equipment.

A book chapter highlighted purchasing and leasing as two possible models for the capital acquisition of advanced diagnostic imaging equipment.(13) In comparing purchasing and leasing models for acquisition of diagnostic equipment, the chapter identified purchasing equipment to be advantageous when the equipment is known to have a long lifespan (e.g., longer than seven years) and limited opportunity to become technically obsolete in the foreseeable future. The chapter suggested that when sufficient capital is unavailable to purchase the equipment outright, similar advantages could be gained through capital leases whereby the lessee owns the equipment at the termination of the lease.(13) However, for equipment with high potential for technological advances, the chapter points to the benefits and flexibility that an operating lease may provide.(13) An additional advantage for leasing equipment may include avoiding some of the service and maintenance costs incurred over the lifespan of the device.

Box 2: Identification, selection and synthesis of research evidence

We identified research evidence (systematic reviews and primary studies) by searching (in February 2017) Health Systems Evidence (www.healthsystemsevidence.org), the Cochrane Library, PubMed, EconLit and ABI/Inform. We searched using the following search strategies.
We searched in Health Systems Evidence: (acquisition OR procurement OR upgrade) AND (technolog* OR imag*). For this search we used the financial arrangements and purchasing products and services filters. We searched in PubMed using: ("acquisition" OR "procure" OR "upgrade") AND imag* AND technolog*. We limited the results to studies in English and those conducted in the past 10 years. In EconLit and ABI/Inform we searched: ("acquisition" OR "procure" OR "upgrade") AND technolog* AND health. We limited search results to studies in English and those conducted in the past 10 years.

The results from the searches were assessed by one reviewer for inclusion. A document was included if it fit within the scope of the questions posed for the rapid synthesis.

For the primary research (if included), we documented the focus of the study, methods used, a description of the sample, the jurisdiction(s) studied, key features of the intervention, and key findings. We then used this extracted information to develop a synthesis of the key findings from the included reviews and primary studies.

Another model of capital acquisition found in a case study and thesis was the use of Managed Equipment Service (MES) contracts for diagnostic imaging equipment. An MES is a contract between a hospital and a private sector service provider which states that the installation, management, maintenance and disposal of medical equipment, as well as training and reporting during the full lifetime of the contract, is the responsibility of the supplier.(14) The use of these contracts originated in the U.K., but appear to be gaining increased traction in other countries (including Canada), with a recent contract created between the William Osler Health System in the Greater Toronto and Hamilton Area and Siemens Canada.(14; 15) Benefits of using an MES contract were found to include:

- budgetary certainty as all annual fees are fixed at the start of a project with fees levelled over the lifetime of the contract;
- managed risks including ongoing maintenance of the medical equipment; and

- expertise and technical knowledge in operating equipment, and training the workforce to use the equipment optimally.(14)

In addition to identifying these three models for the capital acquisition of diagnostic imaging equipment, much of the literature focused on considerations for acquiring, purchasing or renewing technology. One study documented a case study at the Hamilton Health Sciences Centre, which tested the validity of factors for prioritizing the replacement of equipment. The case study found that when properly weighted, a combination of factors were able to reliably predict which equipment should be replaced.(16) Similarly, another three studies and the previously mentioned book chapter offer criteria that should be considered when implementing a medical equipment renewal program or evaluating equipment for replacement. The studies agreed on the following considerations:

- age;
- breakdown and availability rate;
- price and operation cost;
- pace of change for technology or equipment;
- medical benefit and either current or projected utilization;
- safety;
- physical layout of the facility and setting for the new technology;
- ability for the technology to attract patients and physicians; and
- equipment efficiency.(13; 16-19)

One of these studies also highlighted the need to consider additional costs such as the opportunity costs of forgoing other investments, relevant costs that may differ between alternatives and their impact on the organization's budget, and influence costs (e.g., costs and resources used in the decision-making process).(17)

One study documented the management practices of ultrasound and imaging equipment at a hospital in an National Health Service Trust.(18) The study discusses how the process is divided between two groups within the hospital, the Medical Equipment Management Group and the Radiation Safety Steering Group, both of which are comprised of clinical, scientific, managerial, technical and purchasing personnel.(18) Imaging equipment is put on a 10-year replacement program, however, equipment can be replaced before that time on the condition that the equipment no longer meets clinical needs and its use in other departments or organizations within the NHS Trust has been considered.(18) Purchases of new equipment are completed through an open bid process based on the ease of use, manufacturer support, clinical needs, cost, enhanced imaging features, and a clinical and scientific imaging assessment. Clear oversight and management of this process has been found to be linked to several successes including:

- having a better understanding of the financial implications of equipment replacement;
- improved ability to plan yearly expenditures; and
- re-distribution of equipment that would have otherwise been discarded.(18)

Finally, the Canadian Agency of Drugs and Technologies in Health undertook an environmental scan of processes for diagnostic imaging equipment replacement and upgrade across Canada.(2) In general, the scan found that decisions to replace or upgrade equipment follow similar processes across provinces, with most engaging in five-year budgeting cycles for renewing technologies (exceptions being B.C., which uses a 15-month cycle, and Alberta, which favours a three-year cycle), and using contingency funds for emergency replacement.(2) The scan found that various types of information including internal business cases, health technology assessment and clinical practice guidelines informed the decision-making process. Provinces cited changes in the demand for services as being the factor that most affects decisions to replace diagnostic imaging equipment.(2) A further summary of this scan is provided in Table 1.

Table 1: Summary of findings from an environmental scan of diagnostic imaging equipment and upgrade in Canadian provinces (2)

Province and decision-making authority	Decision-making criteria		Purchasing and life cycle guidelines	Cost-control processes
British Columbia – Regional Health Authority	• End of manufacturer support • Frequent equipment failures • Technological change • Volume of patients served • Geographical distribution • Impact on workflow, cost and downstream implications • Equipment cost	• Funding and operating budget implications • Information management and IT requirements • Safety (patient and workplace) • Service delivery • Requirements for academic, research and centres of excellence • Renovation/construction cost	Developed own guidelines for equipment replacement that are updated annually	• Bundled equipment purchases • Establishing provincial contracts with equipment vendors through Health Shared Services BC
Alberta – Alberta Health Services	• Characteristics of the technology • Patient population and patient demographics • Budget and budget options • Setting • Acuity of centre served • Repair frequency • Utilization	• Cost of equipment • Utilization • Redundancy • Cost (equipment, renovation and service) • Equal allocation of equipment across the province • Risk tolerance • Cost-benefit	Canadian Association of Radiologists life cycle guidance and guidelines from the American College of Radiology	• Prioritized list of all diagnostic imaging requests in the province • Bundled equipment purchases • Undertaking province-wide cross-sectional analysis to redeploy equipment to other centres or to consolidate equipment between centres
Saskatchewan – Regional Health Authority	• Age of equipment • Reparability or availability of replacement parts • Utilization (based on volume)	• Proximity of next available site with equipment or service • Budget available • Services provided	Canadian Association of Radiologist life cycle guidance and provincial ministry guidelines	• Bundled equipment purchases through Shared Services Saskatchewan
Manitoba – provincial government	• Characteristics of the technology • Volume of utilization or demand • Age of equipment • Vendor support	• Maintenance and repair costs (cost, number of times the equipment was unavailable) • Number of similar equipment available • Proximity to the nearest centre where the equipment is available	Use of medical equipment replacement scorecard	• Prioritized list of diagnostic imaging equipment evaluated at both the regional and provincial levels • Bundled equipment purchases • Request for proposals where the lowest compliant bidder must be selected
Ontario – individual hospitals (with approval from the Local Health	• Use (physical wear and tear and utilization) • Physical condition of the equipment • Risk • Failure or repair history	• Failure rate • Comparability of the equipment to new products that may offer increased efficacy or efficiency	Not applicable	• Occasional one-off bundled purchasing by Ministry of Health and Long-term Care (e.g., 2004 purchase of 28 CT machines and 8 MRIs)

Integration Network)*	• Product discontinuation • Age of the equipment and vendor support	• Risk factors • Importance of equipment to service delivery • How the equipment is used, how much and the quality and condition of the unit		(20)
Quebec – provincial government	• Age or obsolescence of the technology • Cost of maintenance • Cost of replacement • Utilization	• Criticalness of the equipment • Impact on healthcare personnel • Impact on patient health	Guidance from l'Association des physiciens et ingenieurs biomedicaux du Quebec	• Bundled equipment purchases • Cost-benefit analyses across organizations
New Brunswick – Regional Health Authority	• Age of the equipment • Utilization (present and projected) • Cost of equipment installation and renovations • Staffing resources • Budget or funding available • Clinician or service needs • Patient safety • Risks to staff in operating the equipment	• Availability of alternate equipment and technology • Operational efficiency • Cost reductions associated with equipment replacement • Regulatory or accreditation requirements • Impact on patient care • Access to services • Strategic plan • Urgency of requests	Canadian Association of Radiologist life cycle guidance and professional or medical specialty publications, clinical engineering reports and vendor information on service and equipment performance	• Five-year budget planning, with prioritization by area • Sharing of prioritization lists across areas, regions, provinces and nationally to determine opportunities for combined purchases • Bundled equipment purchasing at national, provincial and regional (e.g., Atlantic) levels
Nova Scotia – Regional Health Authority	• Age and condition of equipment or end of life or obsolesce • Advantages of newer technology (e.g., functionality, efficiency and effectiveness) • Manufacturer support for the technology • Risk of adverse events to patients • Clinical impact of the technology	• Patient demographics, population health impact and population served • Patient flow impacts • Availability of backup equipment • Geographic proximity to similar equipment • Impact of not replacing or upgrading equipment on patient-care services • Net new operational cost and staffing implications	Canadian Association of Radiologist life cycle guidance	• Developing priority lists within one of four provincial "zones" • Single procurement initiatives for purchase of multiple devices • Establishing standing orders with select manufacturers • Provincial master service agreements are in place with each original equipment manufacturer
Prince Edward Island – provincial government	• Age of equipment or end of life • Number of procedures performed	• Service issues	Canadian Association of Radiologists life cycle guidance	• Establishing two-year pricing commitments with vendors • Bundled equipment purchases

Question 2 – What are the economic impacts of the identified models for capital acquisition?

One article and one net present value analysis were found that relate to the economic impacts of different models for capital acquisition, however, no literature was found regarding the economic impacts of managed equipment service contracts. The net present value study compared buying and leasing a CT scanner, but the evaluation, which was conducted in 2006, is now older.(21) The evaluation found that using the net present value method when comparing leasing to buying a CT scanner that cost $1.3 million showed a $116,000 advantage compared to purchase after five years, making leasing advantageous for a CT scanner in this instance.(21) A second, more recent article provided an overview of computing a hypothetical net present value calculation for a CT scanner.(22) This article assumes a 10-year useful life period and a residual value of $200,000, changing the net present value of purchasing the CT scanner.(22) Therefore, if depreciation is slower (e.g., over 10 years rather than five) and some residual value from the CT remains, purchasing may be the preferred option.(22)

In light of the differences in these calculations, the articles note that the following considerations are important when deciding whether to lease or to buy, and in many cases may be context specific and change the results of the evaluation:

- amount available in depreciable tax benefits;
- cancellation clauses in leases;
- predicted technical obsolescence; and
- capital availability.(21)

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APPENDICES

The following tables provide detailed information about the systematic reviews and primary studies identified in the rapid synthesis. The ensuing information was extracted from the following sources:

- systematic reviews - the focus of the review, key findings, last year the literature was searched and the proportion of studies conducted in Canada; and
- primary studies - the focus of the study, methods used, study sample, jurisdiction studied, key features of the intervention and the study findings (based on the outcomes reported in the study).

For the appendix table providing details about the systematic reviews, the fourth column presents a rating of the overall quality of each review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered "high scores." A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1):S8).

All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

Appendix 1: Summary of findings from systematic reviews

Question	Focus of the study	Study characteristics	Key features of the intervention	Key findings
What models can be used for capital acquisition of advanced diagnostic imaging equipment?	Development of acquisition priority checklist for biomedical technologies (16)	*Publication date:* 2010 *Jurisdiction studied:* Hamiton, Ontario *Methods used:* Case study of equipment acquisition priority criteria development	Periop Master Equipment List of 1,883 devices was developed after review of biomed database records and physical inventory of device condition within a two-month period. In order to determine priority guidance of replacement schedules, Priority Index was calculated as a relative number. Criteria scored on a five-point scale and combined in weighted index included: condition, age, frequency of use, replacement part cost, capital value, availability of support, labour hours for maintenance, and risk level of malfunction.	The criteria development proved that items that knowingly needed replacement were 97.4% likely to appear as high priority for acquisition using Priority Index, supporting the reliability of the tool. Condition of equipment, availability of support, and age of unit were time-dependent factors revealed to be inter-dependent. Notably, many factors were rated on a subjective basis, which potentially reduces validity of priority acquisition schedules. Factors not considered included a cost benefit analysis, technology efficacy, and downtime due to data limitations. Accrual cut-off rating was difficult to place due to relative ranking of Priority Index. It is recommended that prioritization criteria be incorporated into existing equipment databases, despite the labour-intensive element, in order to enable proactive purchasing.
	Examining the management of ultrasound equipment at an NHS Trust (18)	*Publication date:* 2014 *Jurisdiction studied:* Sheffield, U.K. *Methods used:* Case-study	Introduction of new management practices, including clinical training and procurement management of ultrasound equipment at one NHS trust hospital	The market for ultrasound equipment has increased rapidly and has resulted in the Sheffield Teaching Hospital having an asset cost more than five million British sterling pounds in ultrasound equipment. Decision-making process for the purchasing of ultrasound equipment advances down two related paths, one of which is through the Medical Equipment Management Group which follows the national guidelines, while the other is through the Radiation Safety Steering Group. The Medical Equipment Management Group is responsible for the purchase of all medical equipment up to 150 British sterling pounds including the purchase, replacement, appropriate use and training. The group has developed a database that contains key information on the equipment including the purchase date, cost, location and technical capabilities. Replacement of equipment is done through the development of a standard business case and the opening of a bid. Equipment is put on a 10-year replacement program, with decisions based on ease of use, manufacturer support, clinical needs, cost, imaging

				features and imaging assessment. The use of this management style has resulted in better financial oversight of equipment replacement and ability to plan around a yearly expenditure figure. In addition, there has been benefit in consolidating equipment from one manufacturer and from re-distributing equipment to other organizations within the NHS Trust.
	Examining the role of medical imaging in modern healthcare systems and the frequency of technology turnover (19)	*Publication date:* October 2014 *Jurisdiction studied:* States under the jurisdiction of The European Society of Radiology (ESR) *Methods used:* This review paper offers teaching points for implementing a medical equipment renewal program. The paper provides a background to the evolution in medical imaging, the equipment life cycle, drivers to renewal, economic considerations, and recommendations.	Provides an overview of the life cycle of radiological considerations and the necessary considerations for planning equipment upgrade or renewal	The life cycle of radiological equipment has an unavoidable decrease in utility, therefore renewal is inevitable. Many departments in the European Union have a considerable proportion of equipment in use that needs to be replaced. Technology progresses with time, creating a threshold for which medical equipment becomes obsolete and where replacement is essential; operating costs of older equipment and a lack of spare parts may make maintaining older equipment a challenge. As technologies age, they run a higher risk of failing and breaking down, which can be especially problematic in clinical settings, for both patients and staff. A plan to renew, or upgrade, medical equipment renewal should be part of every healthcare institution's mandate, which should "look forward" a minimum of five years. The ESR asserts that at this point, state-of-the–art technology has been introduced to the market and should be renewed. Equipment that is properly maintained between six and 10 years can still be suitable for use, but a replacement strategy is encouraged. Maintenance of older equipment becomes costly and the lifetime of equipment deteriorates if maintenance is ignored. Medical practice may be affected based on the decision to change or keep the medical units; considerations of updating practice/competency may be appropriate. Local decisions rely on a combination of multiple criteria: age, breakdown and availability rate, operational costs, repair possibilities, medical benefit of the technology, functionality as regards the clinical requirements, image quality, safety, risk of claims, regulatory obligations, equipment efficiency, and strategic factors such as attractiveness for employees and patients.

				Global costs for running equipment should be observed in addition to costs related to capital acquisition when making decisions about renewal. Other costs can include cost of poor quality, errors and diagnostic delays.
	Examining issues that hospitals and other healthcare providers may have overlooked in the evaluation of new technology (17)	*Publication date:* 2004 *Jurisdiction studied:* United States *Methods used:* Non-systematic overview of past literature on evaluating new technology and comments on additional factors that hospitals and health providers should consider when pruchasing new technologies.	Overview of previous literature evaluating new technology focusing on financial analysis, price negotiations and acquisition errors, and identifies the effects of other cost considerations on the overall price of the new equipment	A large amount of research has examined the evaluation of new technology. This research has primarily focused on financial analysis, price negotiations and avoidance of acquisition errors. However, this study identified other factors that hospitals and other healthcare providers should consider when evaluating new technology. The study mentiond that organizations should consider opportunity costs, relevant and non-relevant costs, and influence costs in their financial analysis in addition to the commonly considered costs such as purchase price. Furthermore, since medical devices are targeted with a large number of class action lawsuits, the study recommended that the threat of litigation should also be considered when assessing the cost of new technology. Another issue that should be considered is whether the decision to purchase new technology should be primarily based on the technology's ability to attract patients and physicians. Although there is some disagreement on this issue, the authors support the idea that the acquisition of new technology should never be based on one measure. Other factors to consider are patient volume and reimbursements by providers. In addition, if a preliminary analysis of the financial viability of a new technology reflects that reimbursement for a piece of new technology is too low, the hospital or other healthcare provider should demonstrate to the payer the long-term cost effectiveness of the new technology. The hospital should also obtain assistance from the manufacturer of the equipment, as it is in the manufacturer's best interest to provide data that persuades the payer to increase payment rates for the new instrument. Another factor that should be considered is ensuring that the physical placement of the technology in the facility is accessible and allows new technology to be accomodated. Lastly, the authors noted that it is critical that all parties, such

				as the governing board, administration and medical staff, follow the rules and procedures of the technology. This demonstrates credibility of the process and allows changes to be made to improve it.
What are the economic impacts of the identified models for capital acquisition?	Analysis of buy-versus-lease decision considering predicted cashflows and non-financial factors (21)	*Publication date:* 2006 *Jurisdiction studied:* U.S. *Methods used:* Economic evaluation of simulated buy-versus-lease decision of free-standing CT centre using net present value calculations	A simulated decision of buying or leasing a free-standing CT centre was considered. Net present value five years after equipment purchase or operating lease were compared to determine fiscal outcome, with information sourced from informal discussions with key informants, and accounting for tax deductible, depreciation, residual value as taxable income, and borrowing rate.	The model considered tax deductible, depreciation, residual value as taxable income, and borrowing rate in computation of net present value to determine whether the buy-versus-lease decision was more fiscally advantageous for free-standing CT centres. Over a five-year operating lease based on hypothetical inputs, net present value of leasing compared to buying was found to be approximately $116,000, making leasing financially advantageous. It is noted that the model is extremely reliant on accurate input values for a valid prediction. Key considerations for deciding to buy or lease equipment include: amount available in depreciable tax benefits, cancellation clauses in leases, technical obsolescence, and capital availability.

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