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A Scoping Review of the Health Technology Procurement Decision Process in Indonesia

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ABSTRACT

Background: There is no doubt technological development in the caring sciences can be an enabler of better outcomes. Technological development and the adoption of new technology can also become a constraint and pose challenges to the current patterns of work and organizational elements. A framework for decision making of when to purchase and incorporate new technology is required.
Purpose: This paper aimed to determine what is known of procurement decisions of advanced technology in healthcare generally and particularly in Indonesia.
Methods: A scoping review was conducted to ascertain the current understanding of what forms the basis of procurement decisions of health technology generally and particularly in Indonesia.
Results: A paucity of peer review literature was identified**.** There was no identified peer-reviewed literature with a focus on Indonesia. Without a guiding evidence base and agreed decision-making framework, it is likely that there is great variation in practices.
Conclusion: In the absence of a solid body of literature to inform practices, two principals to move to a sustainable adoption and integration of advancing and emerging technology into practice in the health care sciences are presented, and provide a scaffold to facilitate navigating what can be tricky waters constituted by enthusiasm and trepidation.

Keywords: Health technology; innovation; nursing; nursing adoption of health technology; procurement

BACKGROUND

At the point of approach to the end of the first one-fifth of the new 21st century, technological development has become synonymous with progress in societal worldview. This societal conceptual formation is applied almost ubiquitously, so it comes as no surprise that people are engaged in a discourse related to technological development in nursing and more broadly, the caring sciences. There is no doubt that technological progress has increased efficiency and quality of service delivery in many domains, and that such advancements hold promise to continue the march in a forward direction. There is little disagreement that such advancement is an enabler of progress. However, it is essential to remain focused on the awareness of what it is that is augmented by the technology. Technology, while it can change work practices and

workflow, does not replace professional capability, but rather augments it. A blind enthusiasm in the value of technology without application of the usual standards of the requirement of evidence and full disclosure of the underpinning philosophy of application has occurred at times in healthcare and healthcare education. In some cases, good or best practice has been constrained as the focus has shifted to being bedazzled by expensive gadgets and programs. As technological advancement can lead to improvements that are expensive and disrupt usual ways of doing work and existing financial budget structures (Cheng, Huang, Ramlogan, & Li, 2017), the investment of money and energy needs to be based on the same standards we have embraced in evidence-based practice. The issue of cost is exacerbated in countries with less money per capita to spend on healthcare and the need for a systematic approach to procurement decisions magnified.

Technological development as a concept is rooted in technology, and the etymological origins of technology come from the Greek word *tekhnologia* meaning systematic treatment. The word can be broken into the origin elements techne art and logos study (Harris, Nagy, & Vardaxis, 2010). Basically, technology is something that is systematically developed to solve problems or promote efficiency. Our minds often race to the latest machines that 'go bing' or digitally based system, but in keeping with the origins of the word technology humans have been refining the technology for centuries in the domain of healthcare (Casselman, Onopa, & Khansa, 2017). So, while of contemporary importance, this topic is not new in nursing or caring sciences generally.

Technological advancements in nursing and healthcare, in general, can become disruptive as they disrupt usual patterns and flow of work, and even disrupt budget structures as purchasing spans conventional divisions (Cheng, Huang, Ramlogan, & Li, 2017; Coye & Kell, 2006). While technology in healthcare has advanced across time as a natural part of evolution, healthcare agencies, particularly when reimbursement and allocation of funding are involved can be less than agile. Businesses and organizations, in general, are geared to incremental change of existing technology as opposed to adapting to the introduction of new technology (Ebersold & Glass, 2015). Technology is often expensive and can represent a substantial investment that influences budgets and the organization's program direction not only in the short terms but across years (Coye & Kell, 2006). The effect of this is plausibly magnified in countries that have lower health budgets per capita.

Indonesia is classified as a low-income country (Seeberg et al., 2013). Current health priorities in Indonesia are underpinned by the need to provide access for the population to universal healthcare. In terms of health spending per capita, Indonesia is ranked 5 out of 7, along with Cambodia and Laos, in Southeast Asian countries (Tangcharoensathien et al., 2011). Healthcare demand is compounded by the high rate of maternal and newborn mortality rates in many regions in Indonesia (Goodburn & Campbell, 2001). A strong focus of healthcare spending is the related basic women and child health issues. In Indonesia, it has been identified that the procurement of advanced technology requires a high degree of financial investment, and the need to develop capabilities is often not existing at the clinician or institutional level (Clifford, Blaya, Hall-Cliffor, & Fraser, 2008). Procurement processes in nursing and healthcare, in general, include

purchasing inclusive of contracting and operational delivery (Lingg, Wyss, & Duran-Arenas, 2016). There is a limited budget to invest in procuring and implementing advanced technology, so the decisions of what to procure are critical.

PURPOSE

This study aimed to determine what is known of procurement decisions of advanced technology in healthcare generally and particularly in Indonesia through a scoping review of the peer-reviewed literature.

METHODS

A scoping review of peer-reviewed literature related to health technology procurement decisions from January 2010 until October 2018 was undertaken (Arksey & O'Malley, 2005) to identify peer-reviewed publications related to procurement decisions of advanced technology in healthcare. The scoping review was selected associated with the breadth of the question and likelihood that a range of papers would be identified that would include varied methods and formats not fitting the requirements of a systematic review. The search terms utilized were: (search one) health technology AND procurement decisions, (search two) health technology assessment AND procurement decisions, and (search three) health technology AND procurement decisions AND Indonesia. The databases searched were CINAHL, Medline, and Health Business Elite. The restrictions of published in English and peer-reviewed were applied. Articles were searched at the abstract level. Abstracts of the returned articles were reviewed, and studies outside the scope of the objectives and duplicates were removed. The pearl growing strategy was utilized in which the reference lists of the identified papers were examined to identify any other relevant papers not identified by the search (Harter, 1986). The included articles were charted with relevant information that included the type of paper, participants, and findings extracted to facilitate a descriptive-analytical review (Arksey & O'Malley, 2005).

RESULTS

The search revealed a paucity of published papers related to health technology procurement decisions in peer-reviewed journals. Both of the searches (one and two) resulted in the same four returns. Three were applicable to the review. The fourth paper was related to perceived barriers to healthcare adoption by healthcare professionals in the United Kingdom with no focus on procurement decisions and excluded from the review. Search three resulted in no identified papers. The included papers were charted (Table 1).

Table 1. Charted search results

Article	Methods	Participants	Findings
Torbica & Cappellaro (2010)	Discussion paper	N/A	Access to health technology is intimately linked to national health coverage, reimbursement, and procurement policies. The decision-making criteria for procurement

Article	Methods	Participants	Findings
			vary significantly in Europe. Numerous studies that examine pharmaceutical spending have been completed, but little attention was paid to medical devices. An evidence-based approach is preferred. Risks of an overly aggressive procurement are high cost, and the risk of an overly defensive approach is delayed access to health technology.
Kosherbayeva et al. (2016)	Implementation report of the introduction of a health technology assessment approach in one hospital in Kazakhstan	The staff of a general city-based hospital in Kazakhstan	The introduction of a health technology assessment process for procurement and use of new health technologies after a trial were conducted on one application. They were found to be successful and were subsequently generalized to seven hospital departments. Considered timely, managers of health care are increasingly interested in rational investment to cover the expanding range of services. The health technology assessment included clinical safety, cost, and clinical effectiveness.
Lingg, Wyss, & Duran-Arenas (2016)	A qualitative study that included 59 interviews of stakeholders representing the macro, meso, and micro levels of those impacted by the procurement of high-risk medical devices in orthopedics. The aim was to compare factors affecting regulations and procurement processes and to understand how they connected to clinical practice.	Stakeholders sampled from Mexico, Switzerland, Germany, and the UK	The factors impacting procurement in the developing country, Mexico differed to those in the European countries and the UK. In Mexico, the cost was a stronger driving factor than evidence. The level of evidence used in health technology assessments was raised as an issue in general, along with a lack of post procurement monitoring for effectiveness.

The review of reference lists did not identify any other papers within the scope of the review. General sources identified in the reference lists that were outside the scope of the review were incorporated in the discussion of the findings. From the limited number of identified papers, there was a consensus that a systematic approach to making procurement decisions related to new technology in the context of healthcare is desirable (Kosherbayeva et al., 2016; Lingg, Wyss & Duran-Arenas, 2016; Torbica & Cappellaro, 2010). Assessment of the technology needs to include the domains of clinical safety, efficacy, and cost-effectiveness (Kosherbayeva et al., 2016; Torbica & Cappellaro, 2010). Compared to other fields of healthcare, such as pharmaceutical intervention, relatively little attention has been paid to technology-related innovations and the development of a systematic approach to decision making of inclusion in the care regime (Torbica & Cappellaro, 2010).

The only research study identified contrasted themes arising from interviews of stakeholders related to procurement decisions from three high-income countries and one middle-income country (Lingg, Wyss & Duran-Arenas, 2016). Of the 59 interviews conducted, 26 were at the macro level of government officials and regulators, six at the institutional meso level responsible for the procurement, and 15 were orthopedic specialists at the user/consumer micro level. In addition, 12 were medical product suppliers. The limitation of not interviewing patients was acknowledged. However, the restriction of health professionals interviewed at the micro user level to medical practitioners was not acknowledged. This limitation is significant as physician preference has previously been raised as an issue that has negatively impacted rational procurement processes (Coye & Kell, 2006).

It was proposed that concerns may differ between countries based on income level and that lower to middle-income countries may be more concerned with broader issues related to providing access to universal health care. The findings supported this, in that in Mexico, the lowest income country included in the study, cost and controlling for corruption surfaced were major drivers in procurement choices. Interestingly, concerns related to the robustness of the quality of evidence used to inform decisions were raised across groups and countries.

The study by Lingg, Wyss, and Duran-Arenas (2016) was related to high-risk medical devices. It can safely be assumed that the issues identified re-robustness of systematic processes to inform choices would be magnified where health technology defined as lower risk is concerned as less regulation exists when the direct risk to patient health is less.

DISCUSSION

While the small amount of identified existing peer-reviewed literature cautions the need to critically consider practice in the area of procurement decisions in the adoption of new health technology, it falls short of informing practice, particularly in low-income countries. To further contextualize the issue a brief consideration of four domains identified in the broader literature in which advancement has accelerated identified in the literature is warranted to highlight the challenges faced and provide glimpses of the future that underpin the importance of this discussion. Much of these advancements are

in domains that would not be categorized as high risk and so do not come under increased regulatory scrutiny where it exists. These areas are the point of care technology including in vivo diagnostics, wearable healthcare, telehealth, and electronic medical records. Two guiding principles are proposed in the context of the review to promote sustainable and evidence-based adoption of health technologies.

Point of care diagnostics

Point of care testing or in vivo diagnostics has become a widely discussed topic in the last decade; however as a topic, it has ascended and reseeded in prominence across time (Huckle, 2008). Point of care testing chronologically came before our experience of modern laboratories, as urine testing and looking at patient fluids was common practice at the point of care for centuries. This sometimes comes as a surprise as for many, if not most, of us as our education and careers have certainly come about in the time since the 1950's when large scale use of blood tests and the need for special rooms to conduct these evolved (Huckle, 2008). Significant developments in technology in the last 20 years, in particular, has seen a dramatic improvement in testing devices with an accompanying increase in quality and safety and the development of closed systems that do not require re-calibration and a subsequent decrease in the expertise required to administer the tests. This device development has been accompanied by a development in digital support capacities to allow reporting and communication of findings and interoperability with other developments, such as the electronic medical record where they exist. The distinction between technological development and information technologies (IT) in the digital age has blurred (Coye & Kell, 2006). Developments of note have occurred, particularly in areas of non-communicable diseases such as diabetes blood glucose monitoring and cardiac care.

Point of care technology development becomes particularly disruptive in terms of workflow and practice and budgets. Work practices include who is able to do the testing, the recording, and communication of results, and when a centralized laboratory is not involved it potentially means changes in support to clinicians in this domain. Central laboratories provide traditionally important support in the interpretation of findings and recommendations for follow up testing (Huckle, 2008). Budgeting implications are clear as costs are shifted from the central laboratory and dispersed at the point of care throughout an organization.

Wearable healthcare

Like the point of care, diagnostics wearables are not a new phenomenon in healthcare (Sultan, 2015). Think of the development of spectacles in the 13th century, hearing aids through the ear trumpet in the 17th century, glass contact lenses in the 19th century, and pacemakers, insulin pumps and soft contact lenses in the 20th century (Casselman, Onopa, & Khansa, 2017). The recent developments in IT through big data analytics have seen an escalation of interest in this domain (Wu, Li, Cheng, & Lin, 2016). The market is vast with the market related to wearable sensors being estimated to increase to $100.35 million in the US alone by the end of 2018 (Casselman et al., 2017). Again the structure of this discussion implies a divide between the point of care diagnostics, wearables, and IT. However, examples provided such as in blood glucose monitoring demonstrate the interdependency. The inter-relatedness is propelling the necessity in the

development of interoperability and standardization of systems (Casselman et al., 2017). Glimpses of the short-term future are provided by examples such as that of Apple targeting development in the area of blood glucose monitoring through development of sensors for the skin and potentially contact levels to measure glucose level through tears (Wu et al., 2016). Again, disruption occurs through the changing practice of work and the flow of patient-related information along with the implications of the budget stream in the organization from which costs are met.

Wearables are intimately related to a shift in thinking from treating illness to a focus on wellness as evidenced through the explosion in the associated market in fitness and fitness trackers. Again, the need to shift the focus from treating illness to promoting wellness is not a new phenomenon and was heavily espoused by Florence Nightingale (Smith, 1982). Healthcare reform internationally is predicated on reducing costs and promoting access to services by re-shaping demand and on doing this, patient engagement is required (Ahern, Woods, Lightowler, Finely, & Houston, 2011). The familiarity with wearable's and embracing the value of the data provided to inform practice is a huge step towards this required engagement.

Telehealth

Telehealth refers to the remote provision of healthcare using telecommunication tools that can include ordinary phones, but more often includes video-enabled devices (Dorsey & Topol, 2016). Telehealth can support patient care, including assessment, patient education, and monitoring (Schwamm, 2014). In line with a shifting focus from ill health to health and wellbeing, a less dominant term that is used interchangeably with telehealth is the term telemedicine. Telehealth can occur through synchronous or real-time contact, or asynchronous contact such as through secure messaging (Schwamm, 2014). It is clear that there are seductive possibilities in terms of convenience for patients, reduced costs in terms of travel costs, and those related to missed work when attending traditional delivery sites. There are also some limits such as those related to access for physical assessment not compensated for by remote sensors and the reliance on reliable internet services to allow a quality service (Dorsey & Topol, 2016).

The main limitation in the expansion of services in this area has been issues of reimbursement (Pearl, 2014). Funding arrangements internationally have been slow to keep pace with developments (Dorsey & Topol, 2016; Schwamm, 2014). Other limitations have related to fears of potential changes in work practices as patients theoretically are now no longer restricted to their local or even national providers for services (Schwamm, 2014). Patients can source service from a variety of providers not limited by geographic proximity. Of course, this promotes access to care but raises concern re business structures and ensuring relevant national standards of care are met.

Electronic medical records

From the somewhat limited published research available, in terms of focus and rigor, not volume, the uptake of health information technology is associated with generally positive results (Buntin, Burke, Hoaglin, & Blumenthal, 2011). The evidence is perhaps described as most convincing around decision support and treatment prescription (Jones, Rudin, Perry, & Shekelle, 2014). The quest for standardization and

interoperability as discussed earlier has often been taken as a need for standardized languages and tick box systems, as opposed to standardized operating platforms. The record systems developed have often not provided the fluidity matching the lived experience of healthcare providers. Despite what the evidence would suggest, uptake and consumer satisfaction have been slower than would be expected. There appears to be a strong link between the human element of satisfaction and utilization that has led to positive outcomes where they have occurred (Buntin et al., 2011). The research as a body has not yet adequately addressed outcomes to the level needed to inform evidence-based policy shifts (Jones et al., 2014).

In line with the integrated nature of the above four domains of exemplars, some shared concerns need to be acknowledged in addition to the disruptive elements identified. These concerns must form part of a cost-benefit analysis. These are security-related concerns. The first and very well publicized concern is that of privacy. The second and equally concerning security concerns are related to 'hackability' and external control. If hacking occurs, patient safety is at stake as well as privacy (Casselman et al., 2017; Ebersold & Glass, 2015). Hacking can include device control to administer treatment or to change transmitted results of sensors and therefore lead to treatment based on false data. Disruptive attacks, such as those leading to a denial of service in which battery operated devices are forced offline, also need to be guarded against and pose a risk (Ebersold & Glass, 2015).

Moving to a sustainable and systematic adoption approach for advancing technology

To move to a sustainable adoption and integration of advancing and emerging technology into practice in the health care sciences, two fundamental principles need consideration. The first is a move from preference and enthusiasm to an evidence-based decision-making process guiding commissioning and procurement. The second principle is the requirement to be fully cognizant of what is being augmented by the integration and be able to clearly articulate the underlying philosophy of existing approaches and the state of play of evidence in the area.

Where adoption of advancing technology or emerging technologies has been concerned, adoption has often been based on individual preferences and enthusiasms couched in the difficult to refuse language of servicing the community and meeting patient need (Coye & Kell, 2006). Enthusiasm can be fueled by vendors offering incentives such as provider education with skewed or little evidence of the impact on the outcome of care. On a related, although slightly tangential note, consider the introduction of high-fidelity mannequins into health education programs as an example. These expensive devices became commonplace despite high costs and high intensity of teacher time requirements despite little and where it exists relatively small-scale evidence of any improvement in achievement in learning outcomes (McGarry, Cashin, & Fowler, 2014). While the literature related to high fidelity human patient simulation is vast, few studies have been conducted that have demonstrated improved learning outcomes as compared to usual teaching practice. In education spheres, the enthusiastic adoption was championed, and these mannequins often became symbols of a progressive school and were integrated into advertising campaigns for particular programs. Adoption of technology must be

based on evidence in congruence with the adoption of evidence-based practice that now underpins many professional standards of practice (Cashin et al., 2015; Cashin et al., 2017).

Being clearly able to articulate precisely what is being augmented and able to articulate the state of play of evidence in that particular area is essential. Bot doctors have been a hot topic of discussion in newspapers and magazines recently. There are often associated claims of greater reliability from the bot doctor in diagnosing than medical practitioner comparisons in the stories (Elder, 2018). Such discussion links to the findings in electronic medical record evaluation of performing well in decision support discussed above. Neither topic of discussion and associated findings are surprising, given that we have known reasonably conclusively since the 1980s that prognostic decisions based on an actuarial approach are superior and more reliable than those based on clinical judgment (Miller & Morris, 1998). By 1989 a review identified more than 100 well-designed studies that demonstrated this (Dawes, Faust, & Meehl, 1989). Perhaps the take-home message is the need to make available resources to facilitate access to consolidated actuarial data to support decision making, whether in digital or other formats, as the primary concern. In this case, the digital advancement just augments dispersion and access.

Although the discussion has been in no way exhaustive, rather aimed at contextualizing the issue with accompanying brief examples, a conclusion will be made by considering electronic medical records a little further. Electronic medical records are language based, as is thought in general (Heidegger, 1962). Language forms the socio-semiotic or the meaning-making context for health disciplines (Cashin, 2011). Language is not only descriptive; it also has a regulatory function in that it encompasses rules of who can say what and invites people to take roles in communicative interactions (Halliday, 1975). Foucault has been credited with describing subjectivity as that of a category which is constructed by the discourses to which an individual is a subject. Language is fluid and in a constant state of flux. It is not just a case of language as a sign that points to something; semiosis also involves the interrelated elements of referent and user (Sless, 1986). Issues have arisen in the design of electronic medical records and the emerging discipline of nursing informatics in which the focus has remained at the level of language as a sign. In attempts to standardize language and create streamlined reporting, scopes of practice have been reduced. The maxim with regard to nursing and more broadly health work that if it is not recorded, it does not occur, has followed, and scopes of practice have been reduced inadvertently (Cashin, 2011). Moving to records with free text boxes may be a potential resolution to this issue as language is not then artificially rendered static and evolution of work practice constrained (Schwamm, 2014). This is important when considering the disruptive element of technological innovation. Such a simple idea, although appearing perhaps lower tech, makes sense if we apply the second principle in the move to a sustainable adoption and integration of advancing and emerging technology into practice in the health care sciences.

CONCLUSION

It is clear that the advancement of technology has characterized healthcare delivery and caring professions throughout time. The focus has intensified in this domain related to

the relatively recent explosions in development in digitally based technology. The future looks bright as solutions emerge to offset increased demand from the rise in the experience of non-communicable diseases and the increased burden on health systems related to increased longevity. There is a paucity of peer-reviewed literature to inform procurement decisions of health technology and incorporation into nursing practice. While this is the case, in general, it is particularly the case in low-income countries where no peer-reviewed papers were identified in this review. Further research is indicated to refine practices. The urgency is amplified in low-income countries where the available money to spend on healthcare is less and the need to optimize spending even greater. The study limited identified literature suggested the likelihood of variance in factors influencing decisions between countries with different income levels. The two principals to move to a sustainable adoption and integration of advancing and emerging technology into practice in the health care sciences outlined provide a scaffold to navigate the tricky waters of knowing what to invest in and when. It also provides criteria on which current processes can be assessed and be incorporated as outcome measures in future studies.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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