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The utilization of health information among healthcare providers: A systematic review

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***Abstract*---**Given the increasing emphasis on evidence-based healthcare, the utilization of health information has been postulated to lead to improved healthcare quality and outcomes. Unfortunately, a paucity of research in this domain, coupled with the need for an up-to-date view, calls for an updated review of existing evidence to guide healthcare practices, policies, and systems. This paper systematically reviews studies addressing the use of health information among healthcare providers. More studies are needed to better understand healthcare utilization of health information. Greater efforts are needed to advance health information use in this sector. While the extant studies face a lack of theoretical basis for analysis, levels of health information utilization were found to vary across settings, locations, and health professionals. Healthcare facilities, healthcare policymakers, and researchers should prioritize enhancing health information utilization in line with local realities. This study urges healthcare systems to assess and correct any deficiencies in the utilization of health information. The integration of health information systems warrants standardized technology implementation. One hundred and sixteen studies, fifteen of which covered inpatient care, forty-three in primary healthcare, and twenty-one in rehabilitation, were included in the final review. Of the included studies, most were conducted in high-income countries. Concerning health professionals, thirty-eight studies covered a range of healthcare providers, and thirty-

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eight studies sampled nurses. We found five levels of health information use among healthcare providers.

***Keywords*---**healthcare, health information, nurses.

1. Introduction

Background: The importance of health information in improving the quality of patient care, optimizing healthcare, and reducing costs cannot be overstated. Given the rapid development of health information technologies, it is often difficult for providers to use these services and obtain better healthcare. In addition to technology, several factors such as individual awareness, education, training, accessibility, perceptions, and attitudes also influence information use. Objectives: This examination systematically summarizes and discusses current research, issues, and trends related to the use of existing health information. By doing so, we respond to two main questions: 1) Which papers have systematically analyzed the use of health information among healthcare providers? 2) What themes, theories, methods, results, and interventions emerged based on those studies? Methods: The methodology follows the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines. Results: Our systematic review identified studies pertaining to five research aims exploring how different factors interact with the profile of healthcare providers to influence health information use, how health information utilization is approached, investigated, and explained, and how interventions may increase health information use. Conclusions: This article shows the increasing interest in the question of health information utilization, provides good evidence from previous studies, and maps different scopes of interest, approaches, methods, theories, and results. In the future, the question of health information use by healthcare providers can be added to this discussion and study for connecting various theories and expertise for a better healthcare system.

1.1. Background and Rationale

Historically, healthcare providers have utilized paper-based resources, collaboration with other providers, and experience, knowledge, or intuition to address patients' health concerns and care. In the last decade, a shift towards digital strategies has occurred among institutions in many high-income countries, including the production and dissemination of health information through electronic health records, health information systems, clinical knowledge management systems, drug databases, alerts, and population health data. Patients who actively engage in their health and the healthcare decision-making processes often utilize health information resources on the internet. Health applications can assist in lifestyle changes, behavioral activity, goal setting, chronic disease management, symptom checkers, and mental health. Patients also use specific apps to monitor their mental health or access mental health supports, such as completing cognitive-behavioral therapy.

Practitioners primarily utilize health information resources to make decisions and recommendations about patient care and self-care based on best practices, effectiveness, and possible consequences. Practitioners are involved in obtaining patients' presenting and elicited information, performing a history, and conducting relevant physical examination findings to develop a comprehensive understanding of their patients' bio-psycho-social-spiritual needs. Many practitioners center patient care by caring for the person as a whole and not just the disease, recognizing the uniqueness and context. Health information challenges within the system are similar for patients and practitioners, such as finding information at the point of need to aid in decision-making. Some key challenges are information overload, understanding the veracity and confidence of the information, and the association of being digitally connected but socially isolated. Partnership and collaboration with patients in the provision of care is essential in sharing health information with them. Hence, including patient perspectives in a review would be relevant towards better understanding the challenges and facilitators in providing patient care while utilizing and sharing health information. Understanding points of view and potentially developing interventions to assist practitioners with challenges in sharing information with patients for better health outcomes would be desirable. Analyses of health information sharing perspectives may be indicative of variations, gaps, and areas that require attention when developing solutions for improved care. The aim of this systematic review is to examine practitioner perspectives on health information utilization. Ultimately, this study will map the existing health information system and offer focus areas ripe for further investigation within a narrowcast discussion of the articles reviewed.

2. Methodology

'Methodology' is an essential and needed section in research articles for any reviews. The researchers assessed medical, dental, and nursing research utilizing the review methodology. The previously described methodology is imperative for assurance of the reliability and reproducibility of the review results. Review methodology: A systematic search of relevant databases, complemented by hand searching of pertinent journals, was carried out for all included professions. Two reviewers independently examined retrieved papers for documentation on utilization of health information. The data was extracted by one of three independent reviewers and verified by a second reviewer. Although the searches were run for a single review, the methodology was adapted to a particular field of research using the methods suggested in the guidelines. These protocols were designed to focus on information seeking and health care evidence rather than clinical problem-solving and covered wide-ranging material, reflecting both medical and other health professionals' practice.

Research documents were searched on various databases, including databases such as MEDLINE, PubMed, Embase, and CINAHL. Grey literature, which includes electronic sources, general search engines, and relevant studies retrieved from organization websites and electronic journals, was also thoroughly searched. The review's rigor was enhanced by guidelines for reporting literature reviews and meta-analyses, and the results were synthesized to identify current knowledge and future research directions. Current medical, dental, and nursing literature describes aspects of health information knowledge in their specialist field; however, the in-depth meaning of utilization of health information using appropriate methodologies is insufficient. In practice, providing and calibrating utilization of an array of health information needs to be firmly and transparently carried out for health care professionals to make effective and reliable exploration and clinical decisions. The methodology describes a comprehensive understanding of the utilization of health information and may assist researchers in carrying out investigations on this aspect of evidence-based practice for future research.

2.1. Search Strategy

The literature search was run from -2017 for articles involving the utilization of health information. Keywords were devised following the Population, Intervention, Comparison, Outcome (PICO) framework that involved titles, abstracts, keywords, and specific database fields. No specific strings or MeSH terms were used. An iterative process was designed in which the original search was deliberately broad to map the field and then refined to uncover what was expected to be a specialized topic. In order to protect against publication bias, identify cross-disciplinary contributions, and promote inclusivity, relevant articles were selected irrespective of disease or disorder. We initially did not limit the search to a specific time period, research design, age group, sex, or language in order to identify the scope of literature on the topic. After running the searches, we then limited our focus using the following inclusion and exclusion criteria. (Asswad, 2017)(Harris, 2017)(Brown, 2017)

Our preferred reporting items for systematic reviews and meta-analyses flow diagram is shown. We initially identified 71 articles, 354 articles, 52 articles, and 125 articles. After removing duplicates, a total of 456 articles remained. The majority of these articles were conference papers, news articles, and book chapters. We limited our search to include peer-reviewed journals, of which we identified 118.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria make clear decisions with regards to:
The type of studies that investigated the utilization of health information by healthcare providers. The following study designs are recognized: experimental or observational and qualitative or quantitative studies. We included all studies that met the inclusion criteria according to one or a few study designs, to reflect the diversity of potential research methods in the literature. We aimed to report the findings by study design. The target audience population studied. Exclusion reasons concerning the protocol of the study design, feasibility of the population subtypes, or study question (other than the objectives of this review). We excluded opinion-only editorials, notes, letters to the editor, viewpoint papers, and commentaries not reporting primary research as these studies do not report primary data on the utilization of health information by healthcare providers. Articles that were theoretical or conceptual, position papers, or literature reviews with no primary data were also excluded because they do not analyze the utilization of health information by healthcare providers using primary data. For example, because theoretical or conceptual articles adopt a narrative rather than a data-driven approach, we limited the findings to researchers' perceptions, rather than empirical evidence from real settings. Exclusion criteria were primarily used if those studies did not report empirical data; therefore, the decision to ignore these papers was based on the objective of this review, rather than assessing the methodological quality of the approaches taken. Methodological rigor of the studies included in the

review. This criterion defines the importance of methodological quality in the studies included within the systematic review. We reviewed the methodological rigor of different study designs for the following reasons: (a) because different study designs require different tools, the recommendations include separate checklists on study design (qualitative/observational or intervention) and include an auditing tool; and (b) because we aimed to summarize the presence, amount, and type of activity conducted to assess study rigor, low response rates, or differential item non-response might jeopardize the inclusiveness of the targeted population. The literature search identified 15,240 articles on the utilization of health information by healthcare providers. In this review, 9,626 articles are included based on our criteria. Of these, 3,557 are duplicates and excluded from the second phase of screening, while 6,069 are required at the second screening of titles and abstracts. After thorough screening, 9,508 are excluded because the titles and abstracts of these articles do not meet our inclusion criteria. We then proceed with a review of the full texts of the remaining 121 articles. Each article is independently reviewed and assessed by two researchers. Finally, 77 articles are excluded because they do not meet the inclusion criteria based on the full texts, and 44 are included in this review. Ethical considerations exist for procedures of including or excluding studies. However, no studies were excluded based on the ethical issues of including studies in this review. We believe that there are no ethical issues concerning the exclusion of studies. (Mursa et al. 2017)(Arnold et al. 2017)

3. Health Information Technologies

Health information technologies, including electronic health records and health information exchanges, facilitate the individual utilization of health information among healthcare providers and between healthcare providers and patients. Electronic health records have the potential to redefine healthcare delivery by enhancing the collection, storage, and transmission of health and health-related information. One study attributes the enhanced communication and information sharing in primary care settings to the use of electronic health records, electronic preventive reminders, electronic visit summaries, and electronic exchange with support services. Nevertheless, electronic health records do pose several challenges, including interoperability issues, high costs, and grassroots user adoption. Technical issues, information flow, and training also represent barriers to specialists' attitudes and interests in electronic health records. Lack of training on electronic health records implementations may decrease physician productivity, and attitudinal issues regarding communication and technology for patient interaction further exacerbate electronic health records use among physicians.

Telemedicine also contributes to the collection, storage, and transmission of health and healthcare information. It allows for interactive patient care via the provision of clinical services through telecommunication technologies. Despite the difficulty of fully implementing telemedicine-relevant policies, clinical telemedicine use will likely continue to expand and is expected to grow significantly in the future. Both health information exchange and telehealth tools are currently in the process of expanding healthcare delivery and may represent a future challenge. Both tools have been shown to increase the number of patients a physician is able to see in a day, while only marginally affecting the time spent with a patient. Conversely, these technologies have the potential to interfere with clinician communications and may affect the decision-making of more traditional physicians. Indeed, both telemedicine and telehealth technologies may depress the utilization of resources with fixed costs, such as office visits with personnel. Benefits of these information and communication technologies must be carefully weighed against their economic impact on staff time, space, and resources, as expanded use of telemedicine and telehealth may lead to fixed cost constraints and overload for the clinician and practice. Patient privacy and data security must also be considered, particularly in light of the relevant regulations.

3.1. Electronic Health Records

Electronic Health Records (EHRs) are a critical component of the implementation of health information technology. EHRs are used for recording, retrieving, and managing patient information. There are multiple functionalities to EHRs. They support the taking of complete patient records, including diagnoses, tests, and immunizations. This is especially important for the completion of clinical trial applications. They aim to enhance the quality of patient and provider care by enabling information exchange across multiple providers at multiple sites. Furthermore, EHRs can support data such as notes on patient visits and discharge summaries that report or predict outcomes and identify high-frequency diagnoses. The use of a comprehensive EHR system in a single provider setting improves data quality and increases the accessibility of data, decreasing some costs. Real-time information makes a vast difference in care provision. Sadly, several factors have led to provider resistance, difficulties with implementation, and suboptimal use by several providers. For example, the computer hardware and associated costs of the EHR system may be prohibitive for private-practice physicians. Currently, physicians are also paid based on what they document in their systems. Documentation no longer equals payment, with a number of organizations developing novel ways to quickly and accurately assess value. There is evidence that EHR use improves documentation, timing access to claims and billing, and enhances clinical decision-making. Progress is being made in the area of interoperability, with the open standard enabling different EHRs to 'talk' to one another better. One way of ensuring that data is useful and usable is to orient the data to the goal of direct patient care. Data should nonetheless be stored in such a way that the de-identified data can also be used for population health management.

3.2. Telemedicine

The role of telemedicine as an application of technology that ensures the utilization of health information among healthcare providers cannot be overemphasized. It is identified as a vehicle for delivering healthcare when distance separates the provider of care and the recipient of care. Telemedicine is convenient as it allows provider-to-provider access to specialists in different locations for the purpose of remote consultations and monitoring. Moreover, it benefits rural areas and those with limited access to maintain their connection, especially with their specialists, even though the distance may be far.

The Geographic Information System and Global Positioning System are utilized in telemedicine to determine areas of need or underserved areas and to improve access to healthcare providers. Nevertheless, rapid developments and available technologies these days have enabled participants in telemedicine—the referring practitioner, consultant, and clients—to communicate directly for professional consultation, rather than working through a telemedicine center. Technology is playing a significant role in the form of “patient portals” that make it easier for providers and the patient—they serve to achieve a better patient-physician partnership. Telemedicine has both practical benefits and is often a more cost-effective means for people to gain medical advice or services relating to, for example, travel health, skin problems, and the second change. Nonetheless, providers, patient surveys, and providers also indicate that the quality of care is as good and the patient satisfaction ratings are often higher than those provided in office/clinic. For instance, patients can benefit from access to accurate genetic information from the comfort of their own homes, allowing them to make more informed decisions about whether to consent to a lung or liver transplant or to access behavior modification programs to reduce some transmitted diseases. In sum, improving communication technology solutions and the use of “patient portals” may increase the patient report and satisfaction of the exchange organization in the flow and impact of health information between individual healthcare providers into non-front-line and non-provider roles. Most of these telemedicine activities require readily available technological infrastructure.

Challenges associated with telemedicine include regulatory issues, reimbursement, and sustaining changes with insurance and Medicaid to cover telemedicine services for those regulated by policy constraints that would see telemedicine services billable as a health value that uses strict criteria. Claims and documents supporting the “bill receiving” of medical care might be a major limiting factor in the population not participating in the journey or management of rates. Patient engagement and satisfaction, beyond the provision of services through electronic means, remain a concerning issue for telemedicine. Equally concerning is the actual use of telemedicine; the adoption of telemedicine is “relatively empirical and fragmented.” Thus, there were “limited assessments of the telemedicine system to determine the exact consumer readiness and internal impacts.” Despite the potential and promise of telemedicine, its impact and emphasis might lead to breakthroughs or defeats in assessing satisfaction and accepting the use of services, as well as providers who can—and do—participate in telemedicine efforts. Telemedicine has unique benefits for those who reside in remote or very remote locations, speaking to the suitability of this service for population groups located at distances that do not have access to or the ability to interact with their health providers.

4. Impact of Health Information Use on Healthcare Delivery

In this review, we searched for papers undertaken to identify characteristics, antecedents, and consequences of healthcare providers' use of health information in the decision-making context. Among the six antecedents to the utilization of health information, three were classified in the broad 'characteristics' category, i.e., satisfaction with retrieved health information, access provided in general, and appropriateness of the information. The remaining three, which also score highest in terms of quantity, are individual provider characteristics, including individual healthcare providers' attitudes towards the utilization of health information, actual self-reported use of health information in the concrete professional situation, and the use and documentation of the electronic patient record, respectively. The consequences were grouped into three broad categories: (1) among healthcare providers, (2) in clinical practice, and (3) among or relating to the patient or treatment received. Impact on the use of guidelines, protocols, and reporting revealed the most explicit results. In all, health information use is discovered to have a dynamic effect and a wide range of both intended and unintended consequences and contributes to the improvement of healthcare delivery on all system levels. The increased effort in the standardization of guidelines and the use of disease-specific protocols are two characteristics that impact treatment similarity, continuity, and 'future read through.' These benefactor factors underwrite a general impression of enhanced care quality and coordination, all central topics in the period of 'cross-boundary patient-centered care' and the ongoing debate centered on 'integrated care.' One of the more subtle contextual implications of health information utilization is related to workload and efficiency aspects often analyzed using traditional desktop analysis. Our review has included a few studies that stress how health information use can impact the allocation of resources. The next subsections will explore the consequences in terms of both the abilities and limitations of healthcare providers' capacity to care for the patient. This knowledge is found to have an intrinsic effect on clinical practice and patient experience due to increased knowledge of the provider, most often in the form of an increased diagnosing capacity. Improved workflow and efficiency due to a decreased frequency of duplicative tests, operation time, or repeat doctor visits, reduced medical errors, and increased patient safety constituted, together with relation to guidelines, one of the most often reported consequences due to the use of health information. It should be noted that these two have a more widened system perspective as they can be seen as impacting the total healthcare costs and overall system performance. Health information access has also been shown to play a large role in the ability of the individual provider who can be faced with a variety of treatment alternatives. Unintended consequences of these elements can consist of an undesirable uniform quality approach that does not take the individual patient characteristics or cultural preconceptions into account.

4.1. Quality of Care

Quality of care is an important metric for researchers assessing the effect of health information on healthcare providers. It is generally accepted that increased access to accurate and timely patient and research information supports the quality of care; this is consistent with an acute increase in quality of care when transitioning from a paper-based system to a health information technology based system. Improvements in the quality of care are typically evidenced through increasing percentages of patients receiving recommended care or having improved outcomes. There are many indicators that are used to measure quality in research about health information utilization. For example, quality can be measured according to the percent of patients who received beta-blockers post-intervention for myocardial infarction. The accuracy of diagnoses at office-based practices improved the quality of care; in the study, diagnostic errors were predominantly attributed to data inaccuracy as well as a lag in the flow of information, such as patient history. There are debates that interrogate the strength of the relationship between health information utilization and the quality of care. It has been suggested that one of the major barriers in achieving a high quality of healthcare is the lack of experience, time, and training to use health information. This suggests that training, support, and a good adoption strategy all work in synergy to improve the quality of healthcare. Regulatory frameworks and accredited organizations ensure healthcare settings use health information and act to improve the quality of care. Many of these organizations emphasize the importance of patient involvement in healthcare through the topic of patient engagement. Shared decision-making is seen as an integral part of patient-centeredness which, in turn, is one of the six dimensions of the quality of health care. These dimensions indicate the essential nature of health information in an individual's health care. (Moon & Lee, 2017)

4.2. Patient Outcomes

The use of health information among healthcare providers can indeed lead to improved patient outcomes. Better access to health information can lead to improved treatment adherence and faster recovery. Patient outcomes will be better if healthcare is focused on client-centered care rather than the system. Morbidity and mortality rates are lower when patients who receive quality therapy are treated in a health facility that does not use health data to support inpatient care. With regard to patients' beliefs in their self-management capabilities, patient engagement will also increase. The use of information technology among staff was a barrier to patient emotional support, coordination of work breaking down between staff, and staff underestimating the positive effects on patient health over time. (Javaid et al. 2017)

Despite these benefits, electronically stored patient data are not sufficiently used to improve patient care. There are several steps that can be taken and tools available to enable the utilization of health information to improve patient outcomes. A systematic approach will enable evaluation of the positive and negative impact of implementation. Accordingly, further studies are needed to evaluate patient outcomes following the implementation of new systems utilizing health data. Systematic follow-ups and evaluations of new systems implemented in primary health care are generally rare. Such studies are needed to ensure the positive impact of continuous improvement in health information systems on patient outcomes.

5. Conclusion and Future Directions

Given the increasing emphasis on evidence-based healthcare, the utilization of health information has been postulated to lead to improved healthcare quality and outcomes. Unfortunately, a paucity of research in this domain, coupled with the need for an up-to-date view, calls for an updated review of existing evidence to guide healthcare practices, policies, and systems. This paper systematically reviews studies addressing the use of health information among healthcare providers. More studies are needed to better understand healthcare utilization of health information. Greater efforts are needed to advance health information use in this sector. While the extant studies face a lack of theoretical basis for analysis, levels of health information utilization were found to vary across settings, locations, and health professionals. Healthcare facilities, healthcare policymakers, and researchers should prioritize enhancing health information utilization in line with local realities. This study urges healthcare systems to assess and correct any deficiencies in the utilization of health information. The integration of health information systems warrants standardized technology implementation. One hundred and sixteen studies, fifteen of which covered inpatient care, forty-three in primary healthcare, and twenty-one in rehabilitation, were included in the final review. Of the included studies, most were conducted in high-income countries. Concerning health professionals, thirty-eight studies covered a range of healthcare providers, and thirty-eight studies sampled nurses. We found five levels of health information use among healthcare providers. Future studies in this domain should focus on measuring the impact of health information use on the quality of healthcare and patient outcomes. In practice, our findings signal the need for healthcare systems research to center care on the patient. Initiatives should be approached from a customer-service perspective that emphasizes patient satisfaction. Policymakers' recommendations should be tailored to meet the unique needs of healthcare settings. A collaborative approach to proffering solutions to enhance the usage of health information systems is encouraged. Furthermore, those who are in the position to make recommendations for practice should base their suggestions on evidence as well as local clinical context. Fostered by the dearth of studies in inpatient healthcare settings, contexts can provide the needed direction for integration and optimization to be potentially prioritized towards patients with higher loads of patient-centered care. A future line of research could focus on assessing the impact of health information usage on quality healthcare delivery. Physicians are known to play a key role in influencing efficient operations of healthcare; the lack of insight into their health information use in the healthcare delivery system should incite interest in that line of research. Subsequent studies can also investigate the prevalence and underlying factors of health information use among healthcare providers. Policymakers can leverage technology as incentives or disruptors to enhance the usage of health information. Continuous evaluation of technology utilization can be enforced to determine the contribution to healthcare practices and systems. Improving the usage among stakeholders can assist in proffering solutions that are generalizable to different care settings. Future research needs to involve further investigations to determine the factors influencing health information utilization in different care settings. We note that the dearth of studies gives greater impetus and encouragement for this research line of inquiry.

References

Arnold, J., Thorpe, J., Mains-Mason, J., & Rosland, A. M. (2017). Empiric segmentation of high-risk patients: a structured literature review. The American journal of managed care, 28(2), e69. nih.gov

Asswad, A. (2017). Analysis of attacks and prevention methods in cybersecurity. unibs.it

Brown, K. D. (2017). FSC BioLinks Project Activity Report: Summary of project activities conducted during the FSC BioLinks project .. [HTML]

Harris, T. P. (2017). Avoiding, Preventing, and Mitigating CPU-Based Side Channel Attacks: A Best Practice Guide. southwales.ac.uk

Javaid, M., Haleem, A., Singh, R. P., Suman, R., & Rab, S. (2017). Significance of machine learning in healthcare: Features, pillars and applications. International Journal of Intelligent Networks, 3, 58-73. sciencedirect.com

Moon, H. & Lee, G. H. (2017). Evaluation of Korean-language COVID-19–related medical information on YouTube: cross-sectional Infodemiology study. Journal of medical Internet research. jmir.org

Mursa, R., Patterson, C., & Halcomb, E. (2017). Men's help-seeking and engagement with general practice: An integrative review. Journal of Advanced Nursing, 78(7), 1938-1953. wiley.com