Health Literacy in Patients' Clinical Records of Hospital Settings: A Systematic Review

Elena Cristofori, RN, PhD student[1], Valentina Zeffiro, PhD, RN[1], Rosaria Alvaro, MsN, RN, FESC, FAAN[1], Fabio D'Agostino, PhD, RN[2], Maurizio Zega, PhD, RN[3] and Antonello Cocchieri, PhD, RN[4] (iD)

Abstract

Introduction: Health literacy (HL) can be defined as the individual's ability to understand and process health information. A low level of HL can be viewed as a stronger predictor of a person's health status than age, education level, and race. Although HL is an important determinant of health, it is often underestimated. This systematic review investigates the evidence on HL assessment in hospital settings.

Methods: PubMed Medline, CINAHL, Scopus, Web of Science and Educational Resources Information Centre databases were searched, with the date last searched being 16 March 2020. The PRISMA guidelines were applied, and the protocol of the study was registered with PROSPERO (CRD42021236029). The quality of the included studies was appraised using the STrengthening the Reporting of OBservational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.

Results: Five studies reported HL assessments in hospital patients' clinical records. Four main strategies were used to implement HL routine assessment in hospitals: multidisciplinary teams, stakeholders, training, and monitoring. Different performance measures were used to monitor the feasibility of incorporating HL assessment into electronic health records (EHRs).

Conclusion: This review examined how inpatients' HL is recorded in hospital settings. HL is poorly measured in a hospital setting. These results guide hospital leadership in involving nurses in HL assessment implementation in hospitals and support nurses in creating a specific performance measure dashboard to monitor effective HL assessments in hospitals.

Keywords

health literacy, nursing, systematic review, health knowledge, electronic health records, clinical documentation

Introduction

The health literacy (HL) concept has been developed over time (Bakker et al., 2021). HL can be defined as the individual's ability to access, understand and process health information to make appropriate decisions that ultimately improve health outcomes (Parnell et al., 2019).

HL plays a fundamental role in patients' healthcare. According to the American Medical Association, HL can be viewed as a stronger predictor of a person's health status than age, education level and race (Parnell et al., 2019; Quinlan et al., 2013). One study found that a low level of HL was strongly related to poorer health outcomes, such as more hospitalisations, improper medication use, higher mortality rates and poorer use of healthcare services, with a consequent greater use of emergency services and lesser use of vaccines (Berkman, Sheridan, Donahue, Halpern, & Crotty,

2011a). Although HL is an important determinant of health, it is often underestimated, and one literature review has

[1]Department of Biomedicine and Prevention, University of Rome Tor Vergata, Via Montpellier 1, 00133 Rome, Italy
[2]UniCamillus, Saint Camillus International University of Health Sciences, Via di Sant'Alessandro 8, 00131 Rome, Italy
[3]Fondazione Policlinico Universitario A. Gemelli, IRCCS, Largo Francesco Vito 1, 00168, Rome, Italy
[4]Section of Hygiene, Woman and Child Health and Public health, Università Cattolica del Sacro Cuore, Fondazione Policlinico Universitario A. Gemelli, IRCCS, Largo Francesco Vito 1, 00168, Rome, Italy

Corresponding Author:
Antonello Cocchieri, PhD, RN, Section of Hygiene, Woman and Child Health and Public health, Università Cattolica del Sacro Cuore, Fondazione Policlinico Universitario A. Gemelli, IRCCS, Largo Francesco Vito 1, 00168, Rome, Italy.
Email: antonello.cocchieri@policlinicogemelli.it

indicated that evaluating it is challenging for health professionals and health systems (Liu et al., 2018).

Interest in HL assessment in the hospital setting has emerged because of the need to ensure that patients and families understand health information and care instructions and to establish good communication between patients and healthcare professionals. Inconsistent communication is one of the causes of sentinel safety events in hospital (Morrison, Gibson, Higgins, & Gutzeit, 2021). Moreover, an HL assessment is necessary to plan tailored interventions, improve their efficacy through patient-centred communication (Bakker et al., 2021) and ensure that patients are prepared and ready for discharge from the hospital to prevent readmission (Parnell et al., 2019). These interventions can mitigate the effects of poor HL and must be provided by health professionals and should be focused on the development of patients' skills (Berkman et al., 2011b).

Measuring patient HL requires specific skills for those healthcare professionals who assess a patient's learning needs, including potential learning barriers (e.g., communication, language and education level) and preferred learning methods and modalities (e.g., direct instruction or personalised learning) (Nair, Satish, Sreedharan, & Ibrahim, 2016). Different measurement instruments have been developed for various population segments and settings, some of which gauge HL in the general population (Liu et al., 2018) or in specific diseases (Kim et al., 2020; Liu et al., 2018). However, no clear consensus exists on how to measure HL in a hospital setting (Duell, Wright, Renzaho, & Bhattacharya, 2015; Haun, Valerio, McCormack, Sorensen, & Paasche-Orlow, 2014; Liu et al., 2018). Furthermore, the effective use of HL instruments could be evaluated in hospital setting. Performance measures (e.g., time required to administer, intention to use, completion rate and experience with HL strategies) are important characteristics to consider because they affect the routine administration of the HL instrument. This impact is mostly found in the areas of communication and patient safety. To the best of our knowledge no systematic reviews have been conducted on this topic.

Background

HL has been placed on the public agenda in various countries. The United Nations stresses that HL is an important factor for improving health outcomes and that appropriate national and international action plans are needed to promote it (United Nations & Social, 2010). However, even though HL has gained international relevance, it remains in its infancy in most world countries, and future development is needed to implement measurement tools in healthcare settings (Jessup, Osborne, Buchbinder, & Beauchamp, 2018; Quaglio et al., 2017).

Internationally, several studies have been conducted to investigate HL levels for both inpatients and outpatients, but they have used different HL definitions and measurement instruments (Haun et al., 2014). This situation has been exacerbated by the lack of a common conceptual framework (Squiers, Peinado, Berkman, Boudewyns, & McCormack, 2012).

HL assessments should be included systematically in patients' clinical records to improve their health and observe international safety and quality standards (Inomata et al., 2018). Clinical records are a fundamental component in professional practice and in the delivery of quality of care, where healthcare professionals document all relevant clinical information (i.e. medical history, patient compliance in the progress, treatment adherence and discharge planning) (Mathioudakis et al., 2016). The clinical record (i.e., electronic or paper) can include different documents and could differ in specific content or in the information's accuracy (Mathioudakis et al., 2016). Therefore, clinical records represent a way for nurses to share healthcare information with other medical professionals and ensure the continuity of care (Molina-Mula & Gallo-Estrada, 2020).

Numerous studies have aimed to develop and use specific instruments in a hospital setting. Perrin et al. (2020) used the Brief Health Literacy Screen (BHLS) in chronic care in a French hospital, but it is unclear whether the BHLS was used as a routine measurement. Bourne et al. (2018) measured HL levels in recently hospitalised patients using the Health Literacy Questionnaire (HLQ). The patients were tested for HL after hospitalisation, but it was unclear whether the results were included in the patients 'clinical records. In other studies, HL was measured as part of nursing studies, but in this case, it was not a routine component of an overall health assessment (Komenaka et al., 2014; Wolf et al., 2007). The incorporation of HL screening into clinical assessments and documentation seems unclear (Wong et al., 2017), and the results observed in hospitals indicate differences (Katz et al., 2021; Roh et al., 2016). A recent systematic review (Liu et al., 2018) identified 11 instruments that have been used to evaluate HL among the general population in nine countries. Most of these instruments were multidimensional and measured a person's ability to obtain, understand and process health information, while others included new dimensions, such as skills in virtual media. This review stressed that the instruments' scoring methods, clinical settings and administration methods were unclear or not effectively explained.

A review of the literature revealed few studies that explored the performance measures of effective use of HL assessment in clinical setting and reported the time required to administer HL instruments as a unique key component of measuring the feasibility (Duell et al., 2015). Moreover, little evidence has been found about the feasibility and effective use of existing instruments or effective documentation in clinical records (Duell et al., 2015). Cafiero, (2013) reported a strong intention to use HL instruments in registered nurses, but they referred only to the outpatient setting. Finally, little evidence exists regarding the acceptability and feasibility of existing HL instruments (Duell et al., 2015).

Therefore, the current study's aim is to provide an overview of HL considerations in hospital settings. The specific

Table 1. Medline Search Strategy.

PUBMED		
	STRING	**RESULTS**
A	("Health Knowledge, Attitudes, Practice"[Mesh] OR "Health Literacy"[Mesh] OR "functional health literacy" OR (numeracy AND "Health Literacy") OR "health literacy" OR "health literate" OR "medical literacy" OR low literacy[ti] OR illiteracy[ti] OR illiterate [ti] OR health literate[ti] OR "information literacy"[mesh])	**117607**
B	("Electronic Health Records"[Mesh] OR "Health Records, Personal"[Mesh] OR "Medical Records, Problem-Oriented"[Mesh] OR "Hospital Records"[Mesh] OR "Medical Records"[Mesh] OR "Nursing Records"[Mesh] OR "Electronic Health Records" OR "Health Records" OR "Problem Oriented Medical Records" OR "Medical Records" OR "Hospital Records" OR "Nursing Records")	**241181**
C	("hospitals" [Mesh] OR hospital OR hospitals)	**5119000**
A AND B AND C	**((((("Health Knowledge, Attitudes, Practice"[Mesh] OR "Health Literacy"[Mesh] OR "functional health literacy" OR (numeracy AND "Health Literacy") OR "health literacy" OR "health literate" OR "medical literacy" OR low literacy[ti] OR illiteracy[ti] OR illiterate [ti] OR health literate[ti] OR "information literacy"[mesh])))) AND (((("Electronic Health Records"[Mesh] OR "Health Records, Personal"[Mesh] OR "Medical Records, Problem-Oriented"[Mesh] OR "Hospital Records"[Mesh] OR "Medical Records"[Mesh] OR "Nursing Records"[Mesh] OR "Electronic Health Records" OR "Health Records" OR "Problem Oriented Medical Records" OR "Medical Records" OR "Hospital Records" OR "Nursing Records")))) AND (((("hospitals" [Mesh] OR hospital OR hospitals)))** https://www.ncbi.nlm.nih.gov/pubmed/?cmd=HistorySearch&querykey=5	**595**

CINAHL	
STRING	**RESULTS**
(("Health Knowledge, Attitudes, Practice"[Mesh] OR "Health Literacy"[Mesh] OR "functional health literacy" OR (numeracy AND "Health Literacy") OR "health literacy" OR "health literate" OR "medical literacy" OR low literacy[ti] OR illiteracy[ti] OR illiterate [ti] OR health literate[ti] OR "information literacy"[mesh])) AND (("Electronic Health Records"[Mesh] OR "Health Records, Personal"[Mesh] OR "Medical Records, Problem-Oriented"[Mesh] OR "Hospital Records"[Mesh] OR "Medical Records"[Mesh] OR "Nursing Records"[Mesh] OR "Electronic Health Records" OR "Health Records" OR "Problem Oriented Medical Records" OR "Medical Records" OR "Hospital Records" OR "Nursing Records")) AND (("hospitals" [Mesh] OR hospital OR hospitals)) http://web.a.ebscohost.com/ehost/resultsadvanced?vid=3&sid=29319c82-e787-4056-b596-d3f5bf87dafe%40sdc-v-sessmgr03&bquery=(±(%22Health+Knowledge%2c+Attitudes%2c+Practice%22%5bMesh%5d+OR+%22Health+Literacy%22%5bMesh%5d+OR+±%e2%80%9cfunctional+health+literacy%e2%80%9d+OR±(numeracy+AND+%22Health+Literacy%22)+OR±%22health+literacy%22+OR+%22health+literate%22+OR+%22medical+literacy%22+OR+low+literacy%5bti%5d+OR+illiteracy%5bti%5d+OR+illiterate+%5bti%5d+OR+health+literate%5bti%5d+OR+%22information+literacy%22%5bmesh%5d)+)+AND+(±(%22Electronic+Health+Records%22%5bMesh%5d+OR+%22Health+Records%2c+Personal%22%5bMesh%5d+OR+%22Medical+Records%2c+Problem-Oriented%22%5bMesh%5d+OR+%22Hospital+Records%22%5bMesh%5d+OR+%22Medical+Records%22%5bMesh%5d+OR+%22Nursing+Records%22%5bMesh%5d+OR+%e2%80%9cElectronic+Health+Records%e2%80%9d+OR+%e2%80%9cHealth+Records%e2%80%9d+OR+%e2%80%9cProblem+Oriented+Medical+Records%e2%80%9d+OR+%e2%80%9cMedical+Records%e2%80%9d+OR+%e2%80%9cHospital+Records%e2%80%9d+OR+%e2%80%9cNursing+Records%e2%80%9d)+)+AND+(±(%22hospitals%22+%5bMesh%5d+OR+hospital+OR+hospitals)+)&bdata=JmRiPWNnaCZkYj1jaGgmZGl9Y21yJmRiPWliaCZkYj1seGgmZGl9bG9oJmRiPXBobCZkYj1ubGViayZkYj1rYWgmZGl9bXpoJmRiPWxzZGNjYSZ0eXBlPTEmc2VhcmNoTW9kZT1TdGFuZGFyZCZzaXRlPWVob3N0LWxpdmUmxpdmU%3d	**27**

SCOPUS	
STRING	**RESULTS**
(KEY (health AND literacy OR health AND education OR health AND illiteracy OR health AND knowledge OR health AND comprehension) AND KEY (medical AND records OR medical AND documentation OR health AND documentation) OR TITLE-ABS-KEY (electronic AND health AND records) OR TITLE-ABS-KEY (hospital AND records) OR TITLE-ABS-KEY (nursing AND records) OR TITLE-ABS-KEY (problem AND oriented AND medical AND records) AND TITLE-ABS-KEY (hospital) OR TITLE-ABS-KEY (hospitals)) https://0-www-scopus-com.opac.unicatt.it/results/results.uri?sort=plf-f&src=s&st1=health+literacy+OR+health+education+OR+health+illiteracy+OR+health+knowledge+OR+health+comprehension&st2=medical+records+OR+medical+documentation+OR+health+documentation&searchTerms=electronic+health+records%3f%21%22*%24hospital+records%3f%21%22*%24nursing+records%3f%21%22*%24problem+oriented+medical+records%3f%21%22*%24hospital%3f%21%22*%24hospitals%3f%21%22%	**122**

(continued)

Table 1. Continued.

SCOPUS	
STRING	**RESULTS**
24&sid = f98c9c7ebddd3ff1bd277cceabaca08d&sot = b&sdt = b&sl = 401&s=%28KEY%28health + literacy + OR + health + education + OR + health + illiteracy + OR + health + knowledge + OR + health + comprehension%29 + AND + KEY%28medical + records + OR + medical + documentation + OR + health + documentation%29 + OR + TITLE-ABS-KEY%28electronic + health + records%29 + OR + TITLE-ABS-KEY%28hospital + records%29 + OR + TITLE-ABS-KEY%28nursing + records%29 + OR + TITLE-ABS-KEY%28problem + oriented + medical + records%29 + AND + TITLE-ABS-KEY%28hospital%29 + OR + TITLE-ABS-KEY%28hospitals%29%29&origin = searchhistory&txGid = 2d203c506acb86f2632c9b278ef0d4a5	

WOS	
STRING	**RESULTS**
(("Health Knowledge, Attitudes, Practice"[Mesh] OR "Health Literacy"[Mesh] OR "functional health literacy" OR (numeracy AND "Health Literacy") OR "health literacy" OR "health literate" OR "medical literacy" OR low literacy[ti] OR illiteracy[ti] OR illiterate [ti] OR health literate[ti] OR "information literacy"[mesh])) AND (("Electronic Health Records"[Mesh] OR "Health Records, Personal"[Mesh] OR "Medical Records, Problem-Oriented"[Mesh] OR "Hospital Records"[Mesh] OR "Medical Records"[Mesh] OR "Nursing Records"[Mesh] OR "Electronic Health Records" OR "Health Records" OR "Problem Oriented Medical Records" OR "Medical Records" OR "Hospital Records" OR "Nursing Records")) AND (("hospitals" [Mesh] OR hospital OR hospitals)) https://apps.webofknowledge.com/Search.do?product = WOS&SID = F5qlEFdRV1QIcHICFHS&search_mode = GeneralSearch&prID = f13ea833-058f-4481-8c54-fe21c79dc012	36

ERIC	
STRING	**RESULTS**
health literacy AND adults AND hospital AND medical records	6
https://eric.ed.gov/?q = health ± literacy ± AND ± adults ± AND ± hospital ± AND ± medical ± records	

research questions were as follows: In what form of the clinical record is HL reported? How was routine HL assessment implemented in the hospital? What performance measures are used in monitoring the HL implementation process? What are the most commonly used instruments used to gauge HL in hospital settings? Who are the healthcare providers who evaluate HL?

Methods

Design

The present review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009), and the protocol review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under protocol number CRD42021236029.

Search Methods

Before the review, the PROSPERO and Cochrane databases were searched to ensure that no other reviews with our aims were already published or in the planning stages. The PubMed Medline, Educational Resources Information Centre (ERIC), CINAHL, Scopus and Web of Science databases were used. No time limit was imposed on the search results, and the last search date was 16 March 2020. Table 1 illustrates the search strategy used.

Three reviewers independently selected the relevant studies according to the established criteria, which are described in the Search outcome paragraph. Each disagreement was resolved through discussions among the reviewers, and a consensus was reached on the inclusion of all the articles used in the current review.

Search Outcomes

We considered studies in journal articles and doctoral theses that included hospitalised patients and focused on HL as one of the main variables recorded in hospital health records. Study protocols, literature reviews and studies in which HL was not systematically included in clinical records, either not measured or not specified were excluded.

The literature search identified 786 studies. After removing duplicates, 727 were deemed eligible for review and were screened for titles and abstracts. The titles and abstracts of the remaining articles were reviewed according to the inclusion criteria, and 113 articles were subjected to full-text screening. Of these, 108 articles were excluded mainly because they included a population group that was not the focus of this review (n = 54; e.g., outpatients, health care professional sample), HL was not systematically included in clinical records, not measured or not specified (n = 44) or because they did not fit with the study design (n = 10). Finally, five articles were included in this review. Figure 1 provides a flowchart of the literature searches based on PRISMA guidelines, detailing the literature selection process.
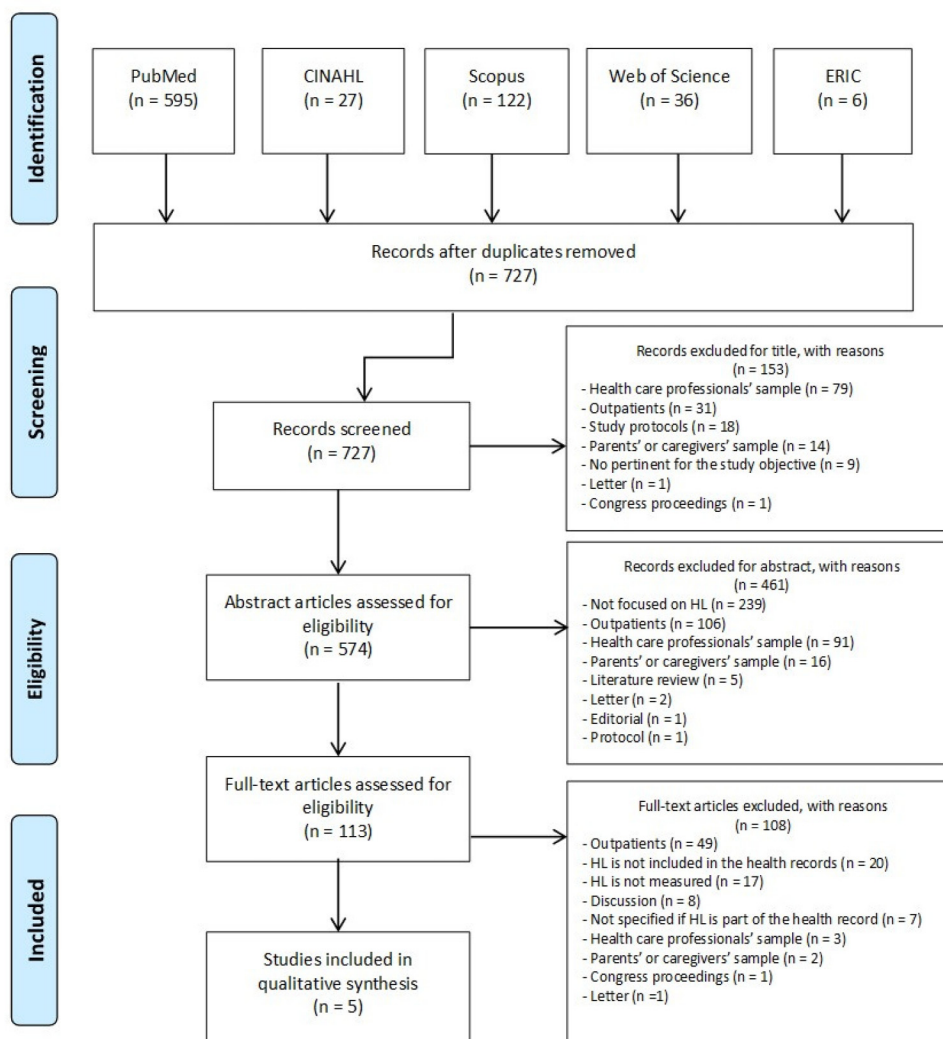
Figure 1. Flowchart of literature searching based on PRISMA guideline.

Quality Appraisal

The quality of the included articles was appraised through the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement (von Elm et al., 2007) for cross-sectional studies. The same three reviewers, who selected the studies, assessed the articles' quality separately, and a final discussion was held to reach consensus. Each article was appraised based on its title, abstract, introduction, methods, results, discussion and other information, such as funding received. One point was given for each item to indicate quality, and studies with a score of 12 or higher were classified as 'high quality' (Lu et al., 2020).

Data Abstraction

The three reviewers extracted the following data independently from each article (see Table 2): first author and year; study design; country; study aim(s); setting and population; HL

instrument; HL documentation type; HL evaluator; and implementation process. Any differences among the reviewers were resolved through discussion and consensus.

Synthesis

This systematic review was conducted in line with the statement, and the protocol review was registered in the PROSPERO. The three reviewers critically appraised the results and quality assessments, and any discrepancies were resolved through discussions during in-person meetings.

Results

Included Studies' Characteristics

Following the selection process, five articles were included in the review. All studies were conducted in the US, published between 2014 and 2018 in peer-reviewed journals, and had

Table 2. Characteristics of Included Studies.

N	Surname/year	Design	Country	Setting	Population size	HL Instrument	Type of documentation (e.g. paper or electronic)	HL Evaluator	Implementation process
1	Cawthon, C/2014	Observational study	Nashville, Tennesse (US)	Academic teaching hospital	Inpatients n = 55.611	Brief Health Literacy Screen (BHLS)	Electronic Health Records (EHR)	Nurses	A resource nurse or nurse educators, provided education concerning HL assessment tool to nursing staff. Education and training methods: trainers training, staff and unit board meetings, distance learning, videos, posters or flyers. Pre post implementation survey.
2	Sand-Jecklin, K/2017	Descriptive study	Morgantown, Virginia (US)	Academic teaching hospital	Inpatient n = 25.557	Expanded Brief Health Literacy Screen (EBHLS)	Electronic Health Records (EHR)	Nursing and ancillary services staff caring	A resource nurse or nurse educators, provided education concerning HL assessment tool to nursing staff. Education and training methods: specific training sessions, posters within the hospitalization unit.
3	Sosland, R/2019	Retrospective study	Nashville, Tennesse (US)	Academic teaching hospital	Inpatients n = 49	Brief Health Literacy Screen (BHLS)	Electronic Health Records (EHR)	Nurses	-
4	Warring, CD/2018	Descriptive study	Gainesville, Florida (US)	Academic teaching hospital	Inpatients n = 1455	Rapid Estimate of Adult Literacy in Medicine - Short Form (REALM-SF)	Electronic Health Records (EHR)	Nurses	A resource nurse or nurse educators, provided education concerning HL assessment tool to nursing staff. 3 months pilot study.
5	Wright, JP/ 2018	Observational study	Nashville, Tennesse (US)	Academic teaching hospital	Inpatients n = 1239	Brief Health Literacy Screen (BHLS)	Electronic Health Records (EHR)	Nurses	Institutionally implemented.

Table 3. STROBE Quality Appraisal of Included Studies.

		Cawthon et al., 2014	Sand-Jecklin et al., 2017	Warring et al., 2018	Wright et al., 2018	Sosland et al., 2019	Not reported N(%)	Reported N(%)
	Title and abstract							
1a	Indicate the study's design in the title/abstract			+			4 (80)	1 (20)
1b	Provide the abstract an informative and balanced summary of what was done and what was found	+	+		+	+	1 (20)	4 (80)
	Introduction							
2	Explain the scientific background and rationale for the investigation being reported		+	+	+		2 (40)	3 (60)
3	State specific objectives, including any prespecified hypotheses	+	+	+	+	+	0	5 (100)
	Methods							
4	Present key elements of study design early in the paper		+	+		+	2 (40)	3 (60)
5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	+	+	+	+	+	0	5 (100)
6	(a) Give the eligibility criteria, and the sources and methods of selection of participants				+	+	3 (60)	2 (40)
7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	+	+	+	+	+	0	5 (100)
8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.		+	+	+	+	1 (20)	4 (80)
9	Describe any efforts to address potential sources of bias					+	4 (80)	1 (20)
10	Explain how the study size was arrived at	+			+	+	2 (40)	3 (60)
11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	+	+		+	+	1(20)	4 (80)
12a	Describe all statistical methods, including those used to control for confounding		+		+	+	2 (40)	3 (60)
12b	Describe any methods used to examine subgroups and interactions		+		+	+	2 (40)	3 (60)
12c	Explain how missing data were addressed						5 (100)	0
12d	If applicable, describe analytical methods taking account of sampling strategy						5 (100)	0
12e	Describe any sensitivity analyses						5 (100)	0

Table 3. Continued.

		Cawthon et al., 2014	Sand-Jecklin et al., 2017	Warring et al., 2018	Wright et al., 2018	Sosland et al., 2019	Not reported N(%)	Reported N(%)
	Results							
13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed		+	+			3 (60)	2 (40)
13b	Give reasons for non-participation at each stage						5 (100)	0
13c	Consider use of a flow diagram						5 (100)	0
14a	Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	+		+	+	+	1 (20)	4 (80)
14b	Indicate number of participants with missing data for each variable of interest						5 (100)	0
15	Report numbers of outcome events or summary measures	+	+	+	+	+	0	5 (100)
16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g. 95% confidence interval). Make clear which confounders were adjusted for and why they were included	+		+	+		2 (40)	3 (60)
16b	Report category boundaries when continuous variables were categorized						5 (100)	0
16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period						5 (100)	0
17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	+	+		+		2 (40)	3 (60)
	Discussion							
18	Summarise key results with reference to study objectives	+	+	+	+	+	0	5 (100)
19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		+	+	+	+	1 (20)	4 (80)
20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	+	+	+	+	+	0	5 (100)
21	Discuss the generalizability (external validity) of the study results						5 (100)	0
	Other information							
22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based		+	+	+	+	1 (20)	4 (80)
	Number of items	**12**	**17**	**15**	**19**	**18**		

an observational descriptive design that, in three cases, was not explicitly reported (Cawthon, Mion, Willens, Roumie, & Kripalani, 2014; Sosland et al., 2019; Wright et al., 2018). In three studies, the main objective was to implement an HL instrument in patients' electronic documentation to verify its feasibility (Cawthon et al., 2014; Sand-Jecklin, Daniels, & Lucke-Wold, 2017; Warring et al., 2018). One study aimed at evaluating the association between HL and postoperative outcomes (Wright et al., 2018), and the remaining study evaluated some factors, including HL related to postoperative complication rates (Sosland et al., 2019).

Quality appraisals indicated a mean score of 16.2 ± 2.77 (range: 12–19). The specific objectives, setting location and number of outcomes were described for each study. All studies were classified as high quality (Lu et al., 2020), and they all described the setting and relevant dates, clearly identified and reported all the outcomes, summarised the key results with reference to study objectives and gave an interpretation of the results. Four studies reported the participants' characteristics (Cawthon et al., 2014; Sosland et al., 2019; Warring et al., 2018; Wright et al., 2018) and discussed the studies' limitations (Sand-Jecklin et al., 2017; Sosland et al., 2019; Warring et al., 2018; Wright et al., 2018). Only two studies explained the participants' eligibility criteria (Sosland et al., 2019; Wright et al., 2018) and defined the number of individuals at each study stage (Sand-Jecklin et al., 2017; Warring et al., 2018). One study described a potential source of bias (Sosland et al., 2019). There was no evidence of data generalisability in any of the studies (Table 3).

The sample size can be classified as very large (more than 55,000 patients) (Cawthon et al., 2014), large (more than 25,000 patients) (Sand-Jecklin et al., 2017), medium (more than 1,000 patients) (Warring et al., 2018; Wright et al., 2018) and small (more than 49 patients) (Sosland et al., 2019). Three studies included all adult patients admitted to the hospital during a predetermined period (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). The other two studies, in addition to the period, considered specific patient populations, i.e., those who had a neurogenic bladder in the benign genitourinary phase (Sosland et al., 2019) and those who were undergoing major abdominal surgery (Wright et al., 2018). All studies were conducted in academic teaching hospitals.

Form of the Clinical Record and HL Assessment Implementation Strategies

Electronic health records (EHRs) were used in all selected studies (Table 2). HL screening was completed in the EHRs in different sections of the clinical records: generic admission section (Sand-Jecklin et al., 2017; Sosland et al., 2019; Warring et al., 2018), specific admission section related to the patients' communication needs (Cawthon et al., 2014) or not specified (Wright et al., 2018). Additionally, in one

study, the HL scores measured during the admission phase were reported in the discharge section (Warring et al., 2018) to develop a personalised nursing care plan.

To develop HL routine assessments in hospitals, four main strategies were identified in three of the studies (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). First, a multidisciplinary team was constituted to choose the appropriate HL instruments. Nurses were included as bedside nurses (Cawthon et al., 2014; Warring et al., 2018), nursing leadership members (Sand-Jecklin et al., 2017) and nurse researchers (Sand-Jecklin et al., 2017).

Second, different stakeholders were identified for the effective deployment of HL instruments in clinical practice and HL instrument incorporation into EHRs (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). Both nursing and information technology leaders were contacted to obtain support for project development. Leadership was identified as a major facilitator of HL implementation and acceptability (Cawthon et al., 2014; Warring et al., 2018).

Third, education on the use of the HL instrument was provided (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). The training was conducted before the HL implementation into EHRs to all nurses involved in the projects (from one to three months). The nursing leadership was educated to disseminate HL screening to nurses on their wards (Cawthon et al., 2014). Furthermore, the nurses were educated through several methods: short video training regarding the use of an HL instrument (Cawthon et al., 2014; Sand-Jecklin et al., 2017), posters placed throughout the hospital wards (Sand-Jecklin et al., 2017) and training about specific education to assist patients with low HL (Sand-Jecklin et al., 2017; Warring et al., 2018).

Finally, a monitoring phase was performed to examine the success of the HL implementation process (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). The performance measures of HL implementation are described below.

Performance Measures of HL Implementation

Different performance measures were used. The completion rates were measured as the percentage of patients screened for HL during the admission phase (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). The completion rates ranged from 82% (Sand-Jecklin et al., 2017) to 91.8% (Cawthon et al., 2014). It was measured by querying the data warehouse office.

The feasibility of incorporating HL screening into clinical assessment was measured through completion rates (Cawthon et al., 2014) or nurses' surveys to measure nurses' perceptions (Sand-Jecklin et al., 2017; Warring et al., 2018). Three studies reported that it is feasible to incorporate HL screening into clinical assessments and patients' clinical records, and that nurses were receptive to HL

screenings because of the ease of use and adequate patient acceptance of the screening process (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Warring et al., 2018). In one study (Sosland et al., 2019), the HL assessment's feasibility in the patients' clinical records did not emerge, but it emphasised the importance of establishing multidisciplinary support in the perioperative stage to tackle many nonclinical barriers, particularly in a sample of patients undergoing complex urology reconstruction. In a study (Wright et al., 2018), the authors noted that accurately assessing and quantifying HL with administrative ease directly in patients' clinical records are important components of patient assessment and are an opportunity for hospital systems to improve patients' hospital experience and safety.

Furthermore, Cawthon et al. (2014) used a specific framework to describe the HL implementation process, also measuring the perception among stakeholders through interviews and individual conversations.

HL Measuring Instruments

Three studies used the three-question BHLS instrument (Cawthon et al., 2014; Sosland et al., 2019; Wright et al., 2018). Sand-Jecklin et al. (2017) administered the three-question Expanded Brief Health Literacy Screening (EBHLS), and Warring et al. (2018) administrated the seven-item Rapid Estimate of Adult Literacy in Medicine —Short Form (REALM-SF). All studies reported the psychometric characteristics of the assessment instruments and/or cited their validation studies.

HL Evaluators, Administration and Measuring Time

Four included studies reported that nurses administered HL assessment instruments (Cawthon et al., 2014; Sosland et al., 2019; Warring et al., 2018; Wright et al., 2018), while in the fifth study, both nurses and ancillary service staff caregivers performed assessments (Sand-Jecklin et al., 2017). In all five studies, the time of performing the HL assessment was based on the clinical evaluation during the admission phase. Cawthon et al. (2014) reported that HL screening was reassessed at each subsequent hospitalisation. Two studies (Sand-Jecklin et al., 2017; Warring et al., 2018) focused on the importance of identifying patients with low HL to design a specific care plan before discharge. Through the use of BHLS, Wright et al. (2018) reported the time required to administer the HL instrument indicating a mean of one to two minutes.

Discussion

This study provides knowledge about the inclusion of routine HL assessments in patients' clinical records. We identified only five studies that described this topic. This finding is particularly surprising because assessing HL increases patient safety (Cawthon et al., 2014; Warring et al., 2018; Wright

et al., 2018) and improves health outcomes (Cawthon et al., 2014; Sand-Jecklin et al., 2017; Sosland et al., 2019; Wright et al., 2018). However, these results might depend on different factors. First, it was often unclear whether HL was assessed as part of clinical research or integrated into the patients' clinical records (Son & Won, 2020). Hence, these studies were not considered.

Moreover, in most studies, the HL of outpatients was measured (Roh et al., 2016). This finding could be explained by the differences in existing requirements for assessment, monitoring and feedback between inpatients and outpatients (Cawthon et al., 2014). In outpatients, HL assessment is generally required during the first access, while for inpatients, HL assessment is required within the first 24 h of hospitalisation and at each change of clinical status (Cawthon et al., 2014). Furthermore, differences in the complexity and acuity of wards could require personalising HL assessment procedures (Cawthon et al., 2014).

Interestingly, all included studies reported that HL assessments were included in the EHRs; this is important since EHRs help to improve healthcare organisation workflows (Ahmed et al., 2020; Alotaibi & Federico, 2017), communication between healthcare professionals from different contexts and countries (Asan, Young, Chewning, & Montague, 2015) and documentation accuracy and the likelihood of using documentation (Ahmed et al., 2020). However, using EHRs requires healthcare professionals to be computer literate, as well as conditions that facilitate the use of EHRs, such as adequate numbers of computers and tablets and sufficient personnel and software to ensure data entry accuracy (Alanazi, Butler-Henderson, & Alanazi, 2020).

Comparing the main strategies utilised to incorporate HL assessment into clinical records, we noticed the importance of involving nurses in a multidisciplinary team. Nurses are necessary in both choosing the appropriate HL and discussing the best methods for including HL assessments in patients' clinical records (Cawthon et al., 2014) and routinely clinical practice. Bedside nurses are fundamental to improving the effective HL measurement and reporting difficulties in routine HL assessment. Nursing leadership members are necessary to monitor effective HL assessments and promote a quality improvement programme.

We found studies that presented nurses' training before HL implementation in clinical records. The included studies mostly focused on how to administer HL instruments and provide personalised care plans for patients with low HL. The courses were delivered using an online and blended approach. However, leadership is recommended (Cawthon et al., 2014) because training in HL measurement and support at all stages of implementation is necessary (Cawthon et al., 2014; Sand-Jecklin et al., 2017). These findings are supported by other research that has reported positively on healthcare professionals' participation in learning

about HL and the use of HL-related tools (Alanazi et al., 2020; Asan et al., 2015).

Various performance measures were used to monitor the feasibility of incorporating HL assessments into patients' clinical records. Routine HL assessments were successfully implemented in the nursing workflow and EHRs. However, we noticed variability in the completion rates. These results depend on different levels of engagement from wards during the HL implementation process (Warring et al., 2018) and different leadership styles (Warring et al., 2018). These findings are reported by other studies where the leadership style is considered a key factor in healthcare and can influence nursing outcomes (Labrague, Al Sabei, Rawajfah, AbuAlRub, & Burney, 2021; O'Donovan et al., 2021).

Regarding nurses' perceptions, studies have reported a positive perception of and support for the process among nursing staff, with no significant differences among nurses with varying years of nursing experience or different age groups (Sand-Jecklin et al., 2017). However, nursing concerns regarding the addition of another area for documentation need to be considered during the process.

Three HL assessment tools were used in the studies. These results are not particularly surprising because no consensus on an HL framework exists and the HL concept has changed over time. Although various studies have reported HL instruments and their psychometric characteristics, in the included studies, we found those that were effectively used in clinical practice.

Nurses are the most frequent healthcare providers in measuring HL. In fact, the HL concept has many implications for nursing (Parnell et al., 2019). Every interaction with patients must include validation of the patient's understanding and capabilities (Parnell et al., 2019). Nurses are responsible for identifying the patient's barrier to comprehending their health information and for providing specific nursing interventions as a way to minimise barriers. Surprisingly, only two studies underlined the importance of measuring the efficacy of nursing interventions reassessing HL levels, and none of the studies included the reassessment of HL during the same hospitalisation. The literature has recommended evaluating their efficacy in reducing emergency department visits or hospitalisations (Sheridan et al., 2011).

The time required to administer the HL instrument was reported in only one study (Wright et al., 2018). Wright et al. (2018) reported that HL assessments require around two minutes. A literature review summarised the time required to administer HL instruments as being from 10 min to 105 min, but its effective use in clinical practice was unclear (Duell et al., 2015). The same review demonstrated that having no time limit for completion was associated with higher HL levels, but suitability for HL instruments should be considered in the implementation of HL assessments in clinical practice (Duell et al., 2015).

Finally, we found that HL levels varied. These results were not particularly surprising because different instruments were used and different settings represented. Although HL was measured, educational interventions aimed at improving HL were not apparent, and HL improvement was not measured.

Study Limitations

Although several large electronic databases were searched, studies in other databases may have been overlooked. Other limitations include only using English language studies and the design of the selected studies; that is, all five chosen studies were descriptive or observational and had considerable variability in their sample sizes.

Implications for Practice

The current study's results indicated that a specific training for all nurses involved at all stages of the HL implementation process is crucial when it comes to improving the effective HL assessments in hospitals.

This review can guide hospital leadership in involving nurses in HL assessment implementation in hospitals. Finally, these results can support nurses in creating a specific performance measure dashboard to monitor the effective HL assessments in hospitals.

Conclusion

Patient-centred care is strongly related to patients' needs and is necessary for better health outcomes, particularly for those with limited HL levels. However, its implementation remains a challenge. Our study highlights that HL routine assessment is still underestimated. The present systematic review of the literature has provided relevant information to improve HL assessment in clinical practice, describing both the strategies used to introduce HL instruments into routine hospital practice and the tools used for its evaluation. The strategies used include nurse leadership, nurse's education and performance outcome measurement.

However, it is important to note that these findings come from to scarce research on HL routine assessment in hospital settings, and none of the reviewed studies included HL reassessment during hospitalization. HL assessment and its monitoring can help healthcare professionals identify patients who may require the use of special tools and strategies to improve communication, knowledge and awareness of their needs so that they can make appropriate healthcare decisions.

The next research step could be to examine the implementation of HL assessments during hospitalisation, evaluate HL near the discharge period and study HL as a modifiable variable. Future studies could carefully detail educational interventions' impact on HL levels and HL efforts' impact on readmissions.

Author Contributions

Criteria	Author Initials
Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;	EC, VZ, AC
Involved in drafting the manuscript or revising it critically for important intellectual content;	EC, VZ, FD, AC
Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content;	EC, VZ, RA, FD, MZ, AC
Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	EC, VZ, RA, FD, MZ, AC

Funding

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ORCID iD

Antonello Cocchieri (iD) https://orcid.org/0000-0002-7694-4986

References

Ahmed, M. H., Bogale, A. D., Tilahun, B., Kalayou, M. H., Klein, J., Mengiste, S. A., & Endehabtu, B. F. (2020). Intention to use electronic medical record and its predictors among health care providers at referral hospitals, north-west Ethiopia, 2019: Using unified theory of acceptance and use technology 2(UTAUT2) model. *BMC Medical Informatics and Decision Making*, *20*(1), 207. https://doi.org/10.1186/s12911-020-01222-x

Alanazi, B., Butler-Henderson, K., & Alanazi, M. (2020). Perceptions of healthcare professionals about the adoption and use of EHR in gulf cooperation council countries: A systematic review. *BMJ Health & Care Informatics*, *27*(1), e100099. https://doi.org/10.1136/bmjhci-2019-100099

Alotaibi, Y. K., & Federico, F. (2017). The impact of health information technology on patient safety. *Saudi Medical Journal*, *38*(12), 1173–1180. https://doi.org/10.15537/smj.2017.12.20631

Asan, O., Young, H. N., Chewning, B., & Montague, E. (2015). How physician electronic health record screen sharing affects patient and doctor non-verbal communication in primary care. *Patient Education and Counselling*, *98*(3), 310–316. https://doi.org/10.1016/j.pec.2014.11.024

Bakker, M. M., Putrik, P., Rademakers, J., van de Laar, M., Vonkeman, H., Kok, M. R., Voorneveld-Nieuwenhuis, H.,

Ramiro, S., de Wit, M., Buchbinder, R., Batterham, R., Osborne, R. H., & Boonen, A. (2021). Addressing health literacy needs in rheumatology: which patient health literacy profiles need the attention of health professionals? *Arthritis Care & Research (Hoboken)*, *73*(1), 100–109. https://doi.org/10.1002/acr.24480

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011a). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine*, *155*(2), 97–107. https://doi.org/10.7326/0003-4819-155-2-201107190-00005

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., Viera, A., Crotty, K., Holland, A., Brasure, M., Lohr, K. N., Harden, E., Tant, E., Wallace, I., & Viswanathan, M. (2011b). Health literacy interventions and outcomes: An updated systematic review. *Evidence Report/Technology Assesment No. 199. (Prepared by RTI International–University of North Carolina Evidence-based Practice Center under contract No. 290-2007-10056-I. AHRQ Publication Number 11-E006. Rockville, MD. Agency for Healthcare Research and Quality.*

Bourne, A., Peerbux, S., Jessup, R., Staples, M., Beauchamp, A., & Buchbinder, R. (2018). Health literacy profile of recently hospitalised patients in the private hospital setting: A cross sectional survey using the health literacy questionnaire (HLQ). *BMC Health Services Research*, *18*(1), 877. https://doi.org/10.1186/s12913-018-3697-2

Cafiero, M. (2013). Nurse practitioners' knowledge, experience, and intention to use health literacy strategies in clinical practice. *Journal of Health Communication*, *18* Suppl 1, 70–81. https://doi.org/10.1080/10810730.2013.825665

Cawthon, C., Mion, L. C., Willens, D. E., Roumie, C. L., & Kripalani, S. (2014). Implementing routine health literacy assessment in hospital and primary care patients. *Joint Commission Journal of Quality and Patient Safety*, *40*(2), 68–76. https://doi.org/10.1016/s1553-7250(14)40008-4

Duell, P., Wright, D., Renzaho, A. M., & Bhattacharya, D. (2015). Optimal health literacy measurement for the clinical setting: A systematic review. *Patient Education and Counselling*, *98*(11), 1295–1307. https://doi.org/10.1016/j.pec.2015.04.003

Haun, J. N., Valerio, M. A., McCormack, L. A., Sorensen, K., & Paasche-Orlow, M. K. (2014). Health literacy measurement: An inventory and descriptive summary of 51 instruments. *Journal of Health Communication*, *19* Suppl 2, 302–333. https://doi.org/10.1080/10810730.2014.936571

Inomata, T., Mizuno, J., Iwagami, M., Kawasaki, S., Shimada, A., Inada, E., Shiang, T., & Amano, A. (2018). The impact of joint commission international accreditation on time periods in the operating room: A retrospective observational study. *PLoS One*, *13*(9), e0204301. https://doi.org/10.1371/journal.pone.0204301

Jessup, R. L., Osborne, R. H., Buchbinder, R., & Beauchamp, A. (2018). Using co-design to develop interventions to address health literacy needs in a hospitalised population. *BMC Health Services Research*, *18*(1), 989. https://doi.org/10.1186/s12913-018-3801-7

Katz, P., Dall'Era, M., Trupin, L., Rush, S., Murphy, L. B., Lanata, C., Criswell, L. A., & Yazdany, J. (2021). Impact of limited health literacy on patient-reported outcomes in systemic lupus erythematosus. *Arthritis Care & Research (Hoboken)*, *73*(1), 110–119. https://doi.org/10.1002/acr.24361

Kim, M. T., Zhushan, L., Nguyen, T. H., Murry, N., Ko, J., Kim, K. B., & Han, H. R. (2020). Development of a diabetes-focused

print health literacy scale using the rapid estimate of adult literacy in medicine model. *Health Literacy Research and Practice*, 4(4), e237–e249. https://doi.org/10.3928/24748307-20201110-01

Komenaka, I. K., Nodora, J. N., Machado, L., Hsu, C. H., Klemens, A. E., Martinez, M. E., Bouton, M. E., Wilhelmson, K. L., & Weiss, B. D. (2014). Health literacy assessment and patient satisfaction in surgical practice. *Surgery*, 155(3), 374–383. https://doi.org/10.1016/j.surg.2013.10.011

Labrague, L. J., Al Sabei, S., Al Rawajfah, O., AbuAlRub, R., & Burney, I. (2021). Authentic leadership and Nurses' motivation to engage in leadership roles: The mediating effects of nurse work environment and leadership self-efficacy. *Journal of Nursing Management*, 29(8), 2444–2452 https://doi.org/10.1111/jonm.13448

Liu, H., Zeng, H., Shen, Y., Zhang, F., Sharma, M., Lai, W., Zhao, Y., Tao, G., Yuan, J., & Zhao, Y. (2018). Assessment tools for health literacy among the general population: A systematic review. *International Journal of Environmental Research and Public Health*, 15(8), 1711. https://doi.org/10.3390/ijerph15081711

Lu, L., Dong, M., Lok, G. K. I., Feng, Y., Wang, G., Ng, C. H., Ungvari, G. S., & Xiang, Y. T. (2020). Worldwide prevalence of sexual harassment towards nurses: A comprehensive meta-analysis of observational studies. *Journal of Advanced Nursing*, 76(4), 980–990. https://doi.org/10.1111/jan.14296

Mathioudakis, A., Rousalova, I., Gagnat, A. A., Saad, N., & Hardavella, G. (2016). How to keep good clinical records. *Breathe (Sheffield, England)*, 12(4), 369–373. https://doi.org/10.1183/20734735.018016

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Molina-Mula, J., & Gallo-Estrada, J. (2020). Impact of nurse-patient relationship on quality of care and patient autonomy in decision-making. *International Journal of Environmental Research adn Public Health*, 17(3), 835. https://doi.org/10.3390/ijerph17030835

Morrison, A. K., Gibson, C., Higgins, C., & Gutzeit, M. (2021). Health literacy-related safety events: A qualitative study of health literacy failures in patient safety events. *Pediatric Quality & Safety*, 6(4), e425. https://doi.org/10.1097/pq9.0000000000000425

Nair, S. C., Satish, K. P., Sreedharan, J., & Ibrahim, H. (2016). Assessing health literacy in the eastern and middle-eastern cultures. *BMC Public Health*, 16, 831. https://doi.org/10.1186/s12889-016-3488-9

O'Donovan, R., Rogers, L., Khurshid, Z., De Brun, A., Nicholson, E., O'Shea, M., Ward, M., & McAuliffe, E. (2021). A systematic review exploring the impact of focal leader behaviours on health care team performance. *Journal of Nursing Management* 29(6), 1420–1443. https://doi.org/10.1111/jonm.13403

Parnell, T. A., Stichler, J. F., Barton, A. J., Loan, L. A., Boyle, D. K., & Allen, P. E. (2019). A concept analysis of health literacy. *Nursing Forum*, 54(3), 315–327. https://doi.org/10.1111/nuf.12331

Perrin, A., Prado, Siqueira do, Duche, L., Schott, A., Dima, A. M., & & Haesebaert, A. L., J. (2020). Using the brief health literacy screen in chronic care in French hospital settings: content validity of patient and healthcare professional reports. *International Journal of Environmental Research and Public Health*, 18(1). 96 https://doi.org/10.3390/ijerph18010096

Quaglio, G., Sorensen, K., Rubig, P., Bertinato, L., Brand, H., Karapiperis, T., Dinca, I., Peetso, T., Kadenbach, K., & Dario,

C. (2017). Accelerating the health literacy agenda in Europe. *Health Promotion International*, 32(6), 1074–1080. https://doi.org/10.1093/heapro/daw028

Quinlan, P., Price, K. O., Magid, S. K., Lyman, S., Mandl, L. A., & Stone, P. W. (2013). The relationship among health literacy, health knowledge, and adherence to treatment in patients with rheumatoid arthritis. *HSS Journal: The Muscoloskeletal Journal of Hospital for Special Surgery*, 9(1), 42–49. https://doi.org/10.1007/s11420-012-9308-6

Roh, Y. H., Lee, B. K., Park, M. H., Noh, J. H., Gong, H. S., & Baek, G. H. (2016). Effects of health literacy on treatment outcome and satisfaction in patients with mallet finger injury. *Journal of Hand Therapy*, 29(4), 459–464. https://doi.org/10.1016/j.jht.2016.06.004

Sand-Jecklin, K., Daniels, C. S., & Lucke-Wold, N. (2017). Incorporating health literacy screening Into Patients' health assessment. *Clinical Nursing Research*, 26(2), 176–190. https://doi.org/10.1177/1054773815619592

Sheridan, S. L., Halpern, D. J., Viera, A. J., Berkman, N. D., Donahue, K. E., & Crotty, K. (2011). Interventions for individuals with low health literacy: A systematic review. *Journal of Health Communication*, 16 Suppl 3, 30–54. https://doi.org/10.1080/10810730.2011.604391

Son, Y. J., & Won, M. H. (2020). Gender differences in the impact of health literacy on hospital readmission among older heart failure patients: A prospective cohort study. *Journal of Advanced Nursing*, 76(6), 1345–1354. https://doi.org/10.1111/jan.14328

Sosland, R., Kowalik, C. A., Cohn, J. A., Milam, D. F., Kaufman, M. R., Dmochowski, R. R., & Reynolds, W. S. (2019). Nonclinical barriers to care for neurogenic patients undergoing Complex urologic reconstruction. *Urology*, 124(1), 271–275. https://doi.org/10.1016/j.urology.2018.08.047

Squiers, L., Peinado, S., Berkman, N., Boudewyns, V., & McCormack, L. (2012). The health literacy skills framework. *Journal of Health Communication*, 17 Suppl 3, 30–54. https://doi.org/10.1080/10810730.2012.713442

United Nations, E., & Social, C. (2010). Health literacy and the millennium development goals: united nations economic and social council (ECOSOC) regional meeting background paper (abstracted). *Journal of Health Communication*, 15 Suppl 2, 211–223. https://doi.org/10.1080/10810730.2010.499996

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gotzsche, P. C., Vandenbroucke, J. P., & Initiative, S. (2007). The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Epidemiology*, 18(6), 800–804. https://doi.org/10.1097/EDE.0b013e3181577654

Warring, C. D., Pinkney, J. R., Delvo-Favre, E. D., Rener, M. R., Lyon, J. A., Jax, B., Alexaitis, I., Cassel, K., Ealy, K., Hagen, M. G., Wright, E. M., Chang, M., Radhakrishnan, N. S., & Leverence, R. R. (2018). Implementation of a routine health literacy assessment at an academic medical center. *Journal of Healthcare Quality*, 40(5), 247–255. https://doi.org/10.1097/JHQ.0000000000000116

Wolf, M. S., Williams, M. V., Parker, R. M., Parikh, N. S., Nowlan, A. W., & Baker, D. W. (2007). Patients' shame and attitudes toward discussing the results of literacy screening. *Journal of Health Communication*, 12(8), 721–732. https://doi.org/10.1080/10810730701672173

Wong, D., Cao, S., Ford, H., Richardson, C., Belenko, D., Tang, E., Ugenti, L., Warsmann, E., Sissons, A., Kulandaivelu, Y.,

Edwards, N., Novak, M., Li, M., & Mucsi, I. (2017). Exploring the use of tablet computer-based electronic data capture system to assess patient reported measures among patients with chronic kidney disease: A pilot study. *BMC Nephrology*, *18*(1), 356. https://doi.org/10.1186/s12882-017-0771-7

Wright, J. P., Edwards, G. C., Goggins, K., Tiwari, V., Maiga, A., Moses, K., Kripalani, S., & Idrees, K. (2018). Association of health literacy With postoperative outcomes in patients undergoing Major abdominal surgery. *JAMA Surgery*, *153*(2), 137–142. https://doi.org/10.1001/jamasurg.2017.3832