

Charting the course: Insights into EMR usability from Australian clinicians – A national survey

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Abstract

Electronic Medical Record Systems (EMRs) are integral to the work of nursing, medical and allied health professionals in Australia and other countries. Successful adoption of EMR systems is reliant upon their usability and effective use. Usability issues impact safety and quality, workflow, communication, and collaboration.

The objective of the study was to measure clinician (nurse, medical and allied health professionals) experience of EMR usability in Australia.

We conducted an observational study using a validated, cross-sectional survey, the National Usability-focused Health Information System Scale (NuHISS). Thirteen usability statements collect clinician impressions of EMRs related to ease of use, benefits and collaboration and technical quality. This paper presents responses of Australian clinicians using EMRs in primary care, hospitals and public and private sectors.

In 2023, 534 health professionals from Australia submitted valid survey responses. The largest respondent group comprised nurses and midwives, working in publicly funded hospitals and having over three years of experience with the EMR mainly used. A majority (69%) agreed that the EMR system is stable and does not crash and 62% felt that the system responds quickly to inputs. Regarding ease of use of the EMR, 50% disagreed that the arrangement of fields and functions is logical, while 58% found the terminology clear and understandable. Sixty-two percent (62%) disagreed that routine tasks can be performed without extra steps, and 65% felt that significant training to learn the EMR is required. Although 63% agreed it is easy to obtain necessary patient information, 45% disagreed that entering and documenting data is quick and smooth. There were mixed responses regarding the EMR system's role in preventing medication errors, with 50% agreeing that it helps prevent errors and 27% disagreeing. There was agreement (74%) that the EMR system supports collaboration and information sharing within the same health service. Respectively, 51% and 47% disagreed regarding support of their EMR for collaboration between different health services and between clinicians and patients.

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We highlight the importance of understanding clinicians' experiences with EMR usability. Our findings suggest areas where EMR usability can be strengthened to enhance user experience and support clinicians in delivering high quality, safe care. The study's findings provide valuable insights for EMR system developers, vendors, and healthcare organisations, emphasising the need to improve usability to realise the full benefits of EMRs and support a digitally enabled healthcare system. Addressing these issues through targeted interventions is essential to enhance clinician satisfaction with the EMRs used, reduce burnout and improve patient care.

Keywords: usability, user experience, electronic medical record, health professional

Introduction

Various studies have explored clinicians' perceptions of electronic health and medical records (EHR and EMR) usability [1-7]. Clinician burnout, stress and fatigue are also attributed to EMR usability [8-13]. Integrated EMRs have been demonstrated to generate benefits for clinicians such as data accessibility and potential to decrease medication errors [14-16]. Other research has identified that clinician usability concerns include complex systems, lack of intuitive EMR interfaces, their ability to contribute to errors and difficulties in sharing patient information [1,4,17,18]. Unexpected outages and downtime for EMR systems have also been reported in the literature as impacting on patient safety, clinician wellness and reported as a usability issue [12,19,20]. Other studies have identified the influence of time spent on in-box management [21], user characteristics and the need for long-term monitoring of EMR development [3,4,22].

Studies in the United States (US) have emphasised user-centred design principles as a requirement to improved usability [2,4]. Usability and interoperability were identified as success factors in an umbrella review on national implementations of electronic health records [23]. In an Australian study, different professional cultures had varying views on EMR use with medical professionals expressing a more negative perception of the EMR system and information quality than other users [5]. A

systematic review that synthesised qualitative evidence revealed tensions including the impact of EMR on clinical workload and productivity [14]. Similarly other studies have found that Australian nursing and medical professionals have different experiences with EMR usability [6,7]. Doctors more positively experienced technical quality features (stability and responsiveness) in the primary care sector than nurses as well as ease of obtaining patient information and prevention of errors [6,7]. In the hospital sector, nurses' experience with EMRs were more positive regarding support for routine task completion, learnability, ease of obtaining patient information and data entry [6,7]. Qualitative data identified safety and risk issues and shortcomings supporting collaboration between healthcare sectors [7].

Countries such as Germany, Iran, Canada, Norway and The Netherlands used a variety of methods to measure usability in National Surveys [24-26]. Ellsworth and colleagues noting the importance of conducting reproducible usability evaluations at various stages of EHR system development [24]. National studies have been conducted over many years (2010-2021) in Finland using a National Usability-focused Scale (NuHISS) a tool that measures categories of usability (ease of use, technical quality, collaboration and benefits) [3,27,28]. A key finding was that perceptions of physicians working in public health centres had improved but those working in public hospitals reported similar or even

more negative experiences in 2021 than in 2010–17 [3]. Studies conducted in the US following the implementation of EMR's suggest usability concerns reporting that clinicians spent significant time on routine tasks such as documenting clinical histories and searching for patient data [8,10,29]. Prior research on this topic and comparative studies are vital to determine if these findings are found in other countries and underscore the need for ongoing measurement of EMR usability to measure improvement and clinician satisfaction.

Context

Australia has a strong health system by international standards delivering good outcomes at a reasonable cost [30,31]. Public and private systems deliver services across all sectors (aged, acute, primary and community). Supported by a universal health system funded by a levy through the taxation system, General Practices operate as private business operations whilst the State Governments contribute funding to, and operate public hospitals. Private hospitals in Australia provide services and surgery for those with health insurance.

In Australia, the term EMR is most used by clinicians while EHR used to refer to the personally controlled summary health record, designed to collect data for each member of the population from 'cradle to grave', known as MyHealth Record (MHR) [32]. In the primary care sector, General Practitioners purchase and use software to manage and administer all aspects of a practice, including scheduling, billing and patient medical records. In the hospital sector, state health departments and private hospitals have acquired EMR systems to meet their needs. States such as Queensland have adopted standard solutions and approaches to implementation (16). Further, some state governments have moved to adopt a Single Digital Patient Record (SDPR) as part of second generational improvements and

upgrades in EMR systems for publicly funded health services [33]. Data sharing with and from the MyHealth Record involves a range of solutions, in NSW, for example, the HealtheNet system integrates with MHR to provide clinicians with access to patient information. This allows for the sharing of documents such as discharge summaries, pathology results, and medication records between hospitals and primary care providers, supporting Health Information Exchange (HIE). A range of EMR products have been adopted in each sector, however market share is dominated by a few vendors. Levels of adoption and maturity of EMR systems differ with few Australian hospitals achieving the highest endorsement of maturity Electronic Medical Record Adoption Model Level 7 (EMRAM), measured by the Health Information and Management Systems Society (HIMSS) [34,35].

In this study the International Standards Organisation definition for usability has been adopted. Usability refers to the 'extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use' [36].

Objective

The objective of the study was to replicate a national survey of usability experiences of Australian clinicians using the NuHISS. The first Australian study was conducted during the COVID-19 pandemic impacting the number of responses received and qualitative and quantitative results reported [6,7]. In this paper we report the findings from quantitative data collected in 2023 and provide study methods, results, discussion of findings, limitations, opportunities for future research, and draw conclusions related to clinician perceptions of EMR usability. Subsequent papers will present

comparisons between professions, sectors and qualitative findings. This paper is focused on the timely sharing of results from the 2023 study as many Australian states are in the process of EMR acquisition and usability is a key consideration.

Methods

This study applied a cross-sectional design and used an online survey and has been reported applying the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [37] (See Additional File 1). Ethical approval for the study was obtained from The University of Tasmania Human Research Ethics Committee (Project id: 28113). Participation in the survey was voluntary and informed consent obtained from all respondents. A participant information sheet was embedded within the survey. Respondents could exit at any time with no data captured. The survey was organised into 5 sections, demographic, healthcare sector and characteristics, usability of EMR systems, EMR details and open text comments. Demographic questions (gender, age, professional background, location of employment, sector and years of EMR experience)

were mandatory to understand respondent characteristics.

We selected the NuHISS as this scale was used in our previous study and suitable for measuring clinician's perceptions of usability in the Australian context [6]. The development of the NuHISS scale, its validation and applications are described by Hypponen et al. [38]. The scale measures technical quality, benefits, support for collaboration and ease of use (Table 1). For each statement a five-point Likert scale was used (Strongly Agree, Agree, Neither Agree or Disagree, Disagree, Strongly disagree). Respondents were also given the option to respond to each statement as Not Applicable. Amendments to the wording of statements were made to align with the terms used in the Australian healthcare system and the participants were asked to assess the usability of the EMR system you MAINLY use by responding to the usability statements. Two questions were added to more fully understand whether EMRs support collaboration and information exchange between clinicians outside of their organisation and with their patients. The full survey is available (See Additional File 2).

Table 1. Domains studied and measures used.

Domain	Measure
Technical quality	Q1) The system is stable in terms of technical functionality (does not crash, no downtime) Q2) The system responds quickly to inputs Q3) The information entered/documentated occasionally disappears from the screen
Ease of use	Q4) The arrangement of fields and functions is logical on the computer screen Q5) Terminology on the screen is clear and understandable (for example titles and labels) Q6) Routine tasks can be performed in a straightforward manner without the need for extra steps using the system Q7) Learning to use the EHR system does not require a lot of training Q8) It is easy to obtain necessary patient information using the EHR system Q9) Entering and documenting patient data is quick, easy and smooth
Benefits	Q10) The system helps in preventing errors and mistakes associated with medications
Collaboration	Systems support collaboration and information sharing between: Q11) Between clinicians in the same service Q12) Between clinicians working in different health services Q13) Between clinician and patients

In May 2023 the survey was released using the LimeSurvey™ Version 3.28.69 a web-based survey platform. Invitations were emailed to 36 professional bodies representing the health disciplines who work in the Australian healthcare system inviting participation. A parallel snowball strategy to promote the survey was applied using the LinkedIn social media platform. As the peak body representing digital health, the Australasian Institute of Digital Health (AIDH) member base was invited to participate.

Data analysis

Response data was downloaded to an Excel™ spreadsheet and then uploaded to SPSS v 29.0.0. After excluding invalid responses or responses from respondents whose work location was overseas, 534 survey responses were eligible for analysis. The margin of error for a base of 534 is $\pm 3.89\%$ at the 95% confidence level. Descriptive statistics were calculated for each statement (mean, standard deviation, mode and median). The internal consistency of the 13 item NuHISS was assessed using Cronbach's alpha. Cronbach's alpha was computed at .843 for the scale, indicating a high level of

reliability [39]. Where the mean was > 3 (agreement) or < 3 (disagreement) on the 5-point Likert scale, these were determined to reflect generally positive or negative views.

Results

Results are reported in two sections. Demographic characteristics to understand the respondents and clinician responses to the thirteen statements.

Respondent characteristics

Table 2 outlines respondent characteristics. The largest respondent group were nurses and midwives combined ($n=260$; 49%) followed by medical doctors ($n=154$; 29%) and allied health clinicians ($n=104$, 19%). Most respondents worked in publicly funded healthcare ($n=504$; 94%) specifically in hospitals ($n=428$; 80%). Most respondents were female ($n = 350$, 66%), aged 35-54 years ($n = 296$, 55%) and work in Victoria ($n = 227$, 43%). Notably, respondents were predominately from the states of Queensland, New South Wales (NSW) and Victoria ($n = 503$, 94%). Most respondents had more than 3 years experience using the EMR ($n=405$, 76%).

Table 2. Respondent characteristics.

		<i>n</i>	% of respondents in the study
Professional background	Allied health and pharmacy	104	19%
	Medical	154	29%
	Nursing/Midwifery	260	49%
	Other	14	3%
	Prefer not to say	2	0%
	Total	534	100%
Gender	Female/Woman	350	66%
	Male/Man	170	32%
	Prefer not to say	7	1%
	Other	2	0%
	Total	529	100%
Age	Less than 25 years	9	2%
	25 - 34 years	83	16%
	35 - 44 years	146	27%
	45 - 54 years	150	28%
	55 - 65 years	121	23%
	65 years and over	23	4%
	Prefer not to say	2	0%
	Total	534	100%
Healthcare sector	Aged care	5	1%
	Hospital	428	80%
	Mental Health	27	5%
	Primary or Community-based Care	51	10%
	Rehabilitation	8	1%
	Other	15	3%
	Total	534	100%
	Location	Australian Capital Territory (ACT)	6
New South Wales (NSW)		73	14%
Northern Territory (NT)		6	1%
Queensland (QLD)		203	38%
South Australia (SA)		11	2%
Tasmania (TAS)		2	0%
Victoria (VIC)		227	43%
Western Australia (WA)		6	1%
Total		534	100%
Funding		Public	504
	Private	21	4%
	Not for profit	3	1%
	I do not know	0	0%
	Other	6	1%
	Total	534	100%
Years of experience (with the EMR mainly used)	Less than 12 Months	33	6%
	1-3 years	96	18%
	3-6 years	201	38%
	>6 years	204	38%
	Total	534	100%

Response to usability questions

Descriptive statistics for the thirteen usability statements are presented (Table 3). A graphic format has also been used with responses to statements presented using a traffic light system for level of agreement (green), disagreement (red) and neither agreeing or disagreeing (orange) (Figures 1-4).

Technical quality

Three usability questions related to technical quality showed varied impressions (Figure 1). Sixty-nine percent (n=367) of respondents agreed that the EMR system they mainly use is stable in terms of technical functionality whereas 25 % (n=131) disagreed. More than half (n=334, 62%) of respondents agreed that the EMR system they mainly use responds quickly to inputs. Of note 26% (n=138) of respondents disagreed. The number of responses that agreed that information occasionally disappears from the screen was 35% (n=190) whilst 50% (n=269) disagreed with this statement.

Table 3. Clinician responses to usability questions.

	NA [0]	Strongly Disagree [1]	Somew- hat Disagree [2]	Neither agree or disagree [3]	Somew- hat Agree [4]	Strongly Agree [5]	Total n (%)	Mean	Mode	Median 4	SD
Technical quality											
The system is stable in terms of technical functionality (does not crash, no down-time)	-	37 (7)	94 (18)	36 (7)	241 (45)	126 (24)	534	3.61	4	4	1.22
The system responds quickly to inputs	3 (1)	48 (9)	90 (17)	59 (11)	226 (42)	108 (20)	534	3.46	4	4	1.26
The information entered/documentated occasionally disappears from the screen	5 (1)	150 (28)	119 (22)	70 (13)	151 (28)	39 (7)	534	2.62	4	2	1.36
Ease of use											
The arrangement of fields and functions is logical on the computer screen	-	120 (22)	149 (28)	63 (12)	154 (29)	48 (9)	534	2.74	4	2	1.33
Terminology on the screen is clear and understandable (for example titles and labels)	-	65 (12)	104 (19)	56 (10)	225 (42)	84 (16)	534	3.30	4	4	1.28
Routine tasks can be performed in a straightforward manner without the need for extra steps using the EMR system	2 (0)	175 (33)	154 (29)	48 (9)	109 (20)	46 (9)	534	2.42	1	2	1.36

Learning to use the EMR system does not require a lot of training	2 (0)	180 (34)	167 (31)	61 (11)	100 (19)	24 (4)	534	2.28	1	2	1.24
It is easy to obtain necessary patient information using the EMR system	3 (1)	66 (12)	91 (17)	41 (8)	222 (42)	111 (21)	534	3.40	4	4	1.34
Entering and documenting patient data is quick, easy and smooth	10 (2)	108 (20)	134 (25)	76 (14)	156 (29)	50 (9)	534	2.77	4	3	1.36
Benefits											
The EMR system helps in preventing errors and mistakes associated with medications	63 (12)	62 (12)	81 (15)	58 (11)	194 (36)	76 (14)	534	2.91	4	4	1.61
Collaboration and information sharing											
The EMR system supports collaboration and information exchange between clinicians in the same service	3 (1)	23 (4)	71 (13)	39 (7)	221 (41)	177 (33)	534	3.84	4	4	1.18
The EMR system supports collaboration and information exchange between clinicians working in different health services	16 (3)	178 (33)	95 (18)	41 (8)	132 (25)	72 (13)	534	2.58	1	2	1.55
The EMR system supports collaboration and information exchange between clinicians and patients	45 (8)	147 (28)	99 (19)	118 (22)	93 (17)	32 (6)	534	2.31	1	2	1.41

*Values for percentages have been rounded to aid presentation.

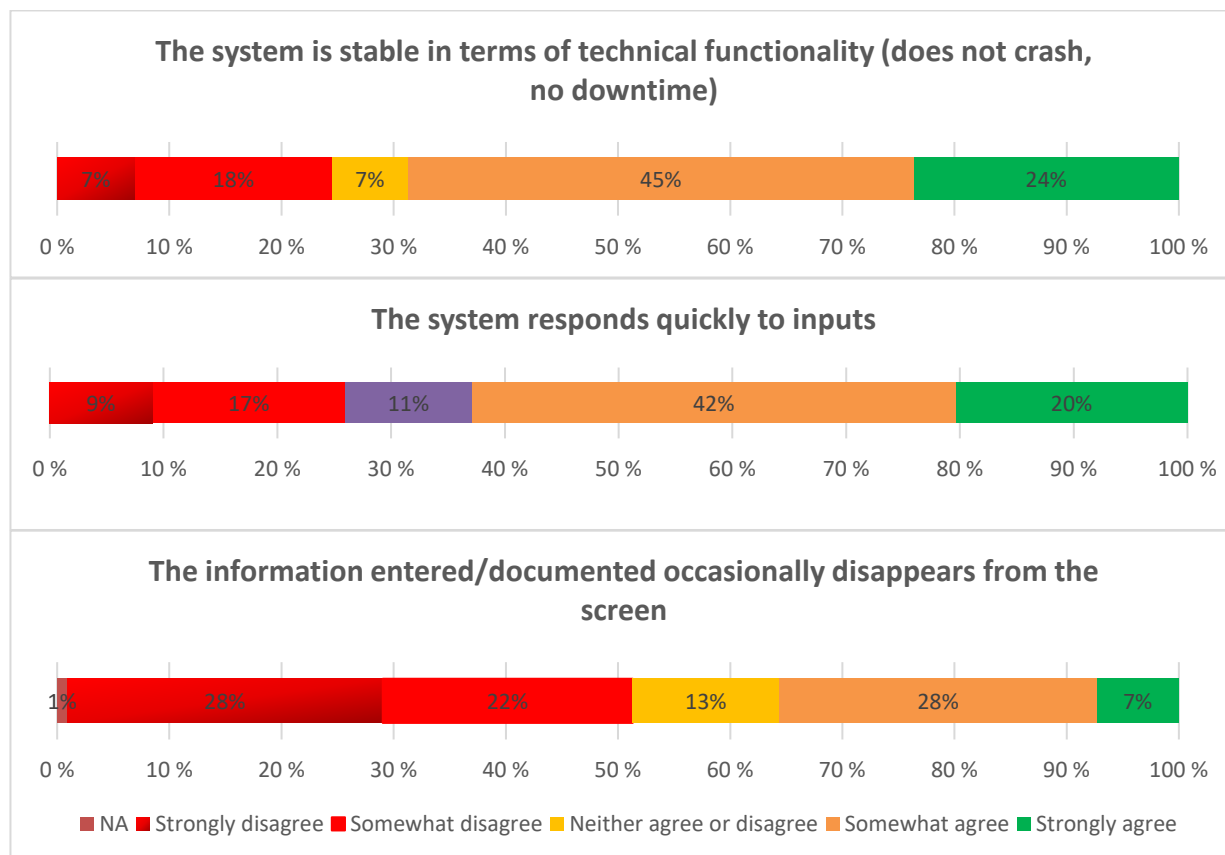


Figure 1. Technical quality of EMR systems.

Ease of use

Six questions were asked in relation to ease of use of EMR systems used and shown in Figure 2 below. When asked about the arrangement of fields and functions on the screen being logical, half 50 % (n=269) disagreed. On the issue of the terminology on the screen being clear and understandable, 58 % (n=309) clinicians agreed that the EMR system they mainly use provides this, with 31 % (n=169) disagreeing. When asked if routine tasks be completed in a straightforward manner without the need for extra steps well over half 62 % (n=329) disagreed

and supported by the mean, mode and median all less than 3. Concerning learning the EMR without a lot of training by users, only 23 % (n=124) agreed that the EMR system they mainly use supports “low touch learning”. In contrast, 65 % (n=347) disagreed. Respondents were asked about the ease with which users can obtain patient information using their EMR systems, with 62 % (n=333) of respondents agreeing that the EMR system they use assisting this objective. There was a high percentage (45%) of respondents who didn’t agree that entering and documenting patient data is quick, easy and smooth but (38%) that agreed.

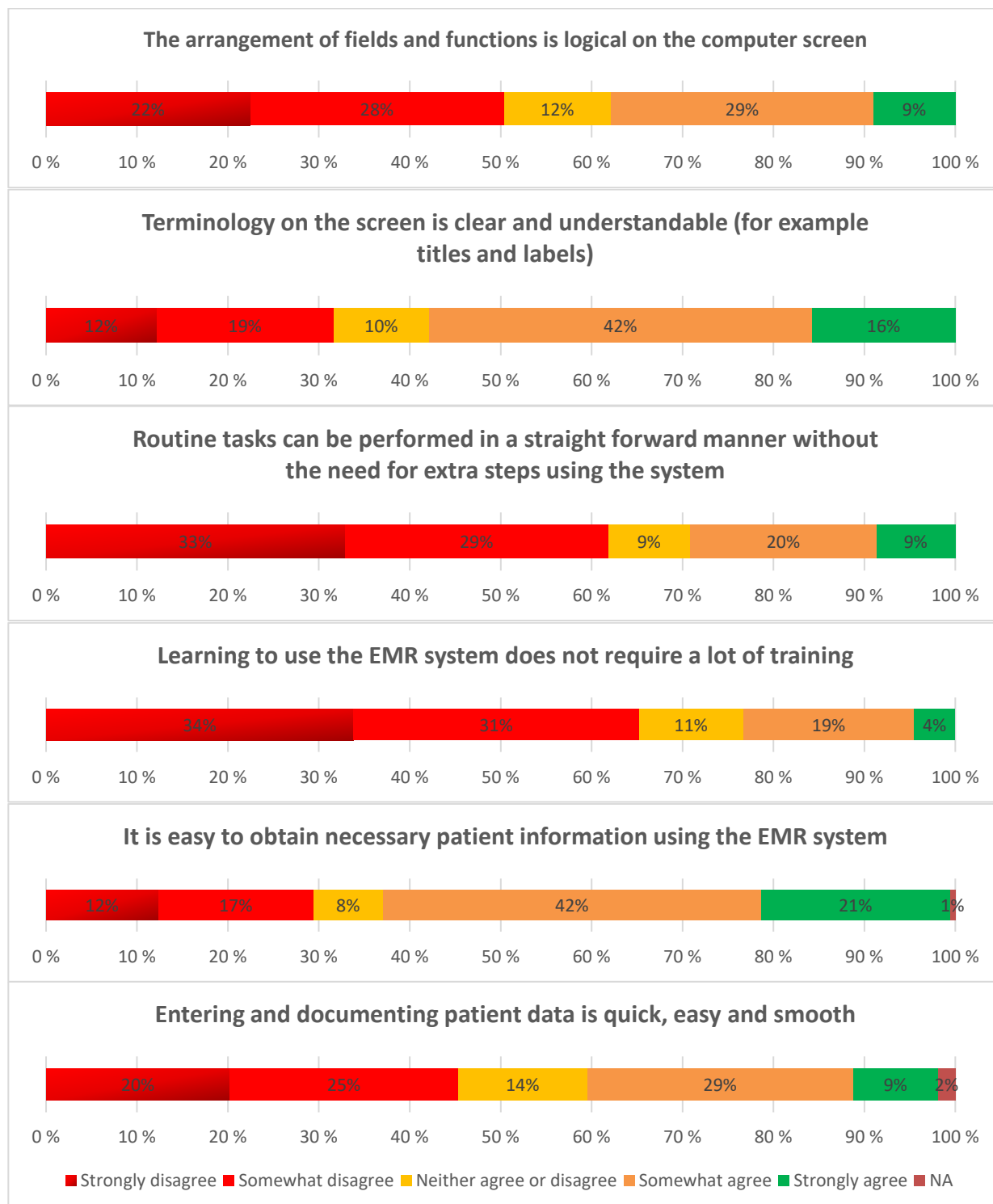


Figure 2. Ease of Use of EMR Systems.

Benefits

The NuHISS only includes a single usability question, linked to benefits of EMRs (Figure 3). A mixed picture was evident when clinicians were asked about the EMR system helping to prevent errors and mistakes associated with medications with half agreeing, 27 % (n=143) disagreeing and 11 % (n=58) neither agreeing or disagreeing. Option 4, somewhat agree accounted for 36% (n=194) of total responses to this question.

Collaboration and Information sharing

Figure 4 shows the responses to questions for EMR support for collaboration and information exchange within health services, across sectors and with patients and clinicians. When answering the

question about the extent to which EMR systems support collaboration and information sharing between clinicians working in the same health services 74 % (n=398) agreed that their EMR system supported this. In contrast, when responding to the statement about the extent to which EMR systems support collaboration and information sharing between clinicians working in different health services 51 % (n=273) respondents disagreed that their EMR system supported this. When asked about the extent to which EMR systems support collaboration and information sharing between clinicians and patients 47% (n=246) of respondents indicated that they disagreed that their EMR system supported collaboration and information sharing between themselves and patients.

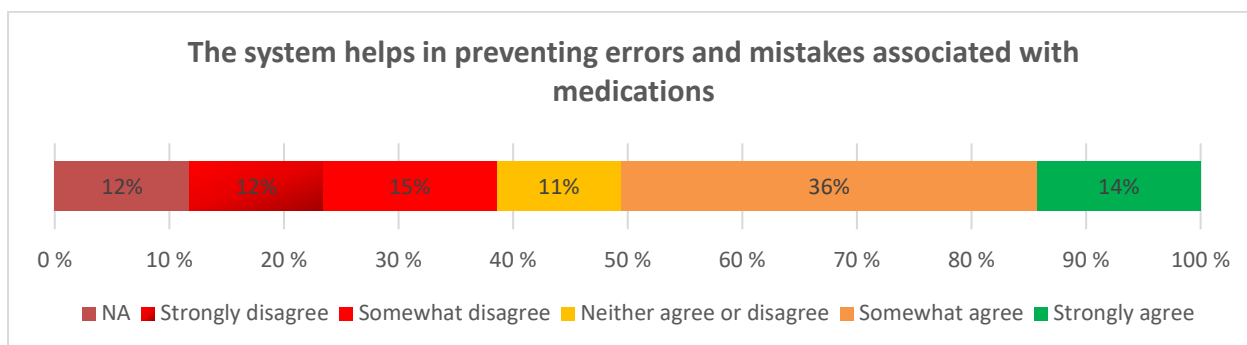


Figure 3. Benefit of EMR Systems.

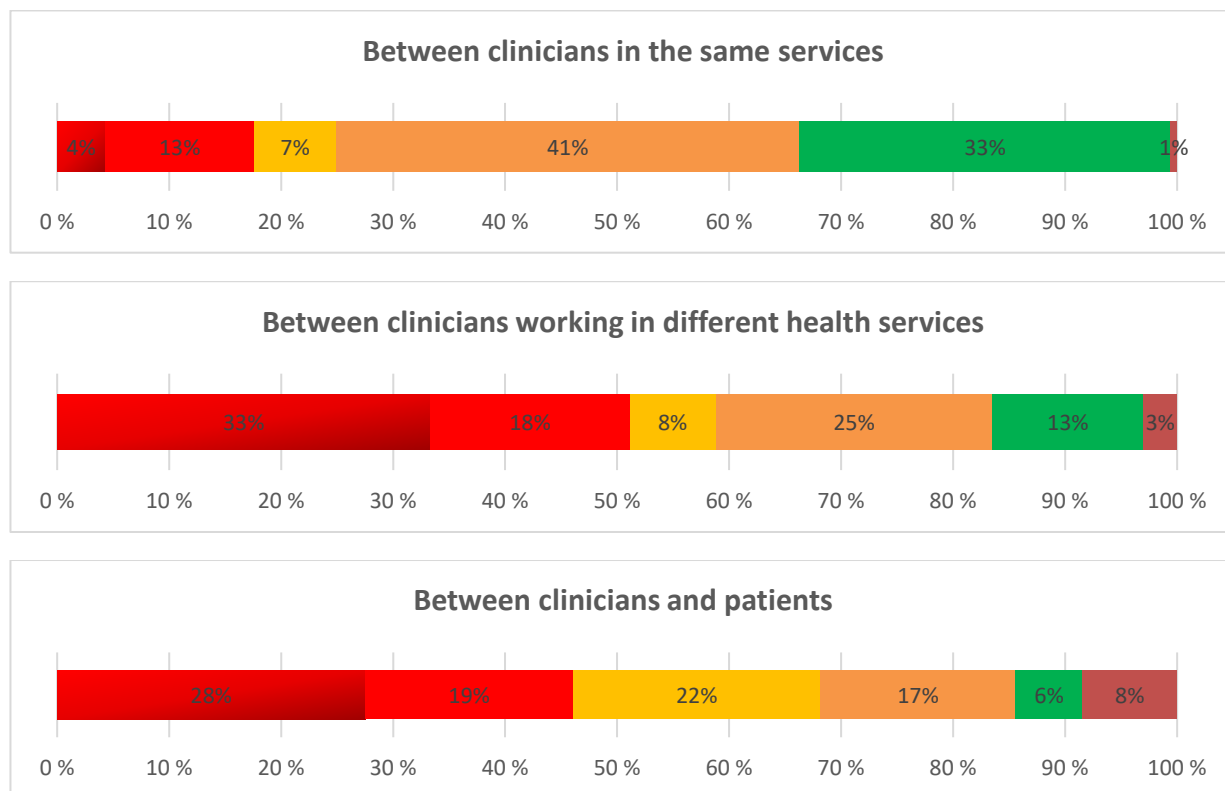


Figure 4. Support for Collaboration and Information Exchange of EMR Systems.

Discussion

This study provides new insights into clinician perceptions of the usability of EMR systems in Australia. We used a validated tool, the NuHISS to measure usability [38, 40]. Our sample predominantly consists of nurses located on the East-coast of Australia, with most respondents aged 35 or older and more than three years' experience using EMRs. Despite extensive communication about the survey opportunity across all parts of healthcare in Australia, the sample could reflect the predominant pattern of EMR installations across the country as opposed to a responder bias with some states yet to implement comprehensive EMR solutions.

The clinicians in this study reported positive experiences with the main EMR system they use and identified areas for improvement. Positive experiences are highlighted with respect to technical stability and responsiveness of EMR systems concurring with consensus in the literature regarding the contribution of these factors to user satisfaction and experience [12,18,41]. The support of EMRs for collaboration and exchange of information within a health service was assessed favourably and is a key enabler of care [14,41]. Clear and understandable terminology on EMR screens was viewed positively as was support of the EMR for clinicians to obtain necessary information, essential to the delivery of timely and effective patient care [1,14]. Importantly, while we cannot definitively claim that clinician's felt the EMR helped to prevent medication errors over half agreed with this statement and this is heartening in view of the role of EMRs in preventing medication and other errors, contributing to safe care, a major benefit to be attained by adopting EMR systems [14-16]. This question was not applicable for 12% of respondents, suggesting that they are not responsible for medication

management, reflecting the presence of allied health and other professions in the sample.

Clinicians also identified areas for improvement with the main EMR they used. This includes support for completion of routine tasks and 'learnability' of the EMR system. The lack of intuitiveness and ease of learning for EMR systems coupled with a highly mobile clinician population may lead to an underutilisation of EMR functionalities and the need for additional training [7]. Clinician responses suggest that support for collaboration and information exchange between clinicians working in different health sectors and between clinicians and patients could be strengthened. The role of EMRs and data exchange through the facilitation of communication in the context of a healthcare system with multiple components delivering parts of comprehensive care is well documented in the literature [13,42].

According to participants in our study difficulties with sharing of information between and across health sectors remain. Solving this is complex and implementation of EMRs in each sector has been performed in isolation. The slow adoption of comprehensive standards to achieve functional interoperability, for example, standards for: healthcare identifiers; terminologies, classification, and code sets; Fast Healthcare Interoperability Resources FHIR® and HL7 has created barriers to information sharing and collaboration [14,23,41,43] and remains a work in progress in Australia and many other countries. Enabling clinicians to share treatment plans and support communication with patients is a major step towards more active involvement in self-management, adherence to treatment and communication to improve adherence and ultimately population health [44]. For stakeholders acquiring EMR systems it is critical to understand the progress and practices that vendors apply to

improve human oriented design and interfaces and support clinician workflows [20,45].

The findings from this research provide valuable insights for EMR system developers, vendors and healthcare organisations seeking to enhance usability and optimise clinical workflows. Factors, such as a lack of intuitiveness of EMR interfaces and design and support for clinical workflows can be problematic in a workforce characterised by use of staffing pools, locums and casuals who use and access EMRs and contributes to data quality, clinician fatigue and well-being issues [7,9-11].

Future research

This study provides baseline data on the usability experiences of Australian clinicians. However, several areas warrant further investigation. First, qualitative data could provide further insights as the most desirable usability features in the EMR systems used. We intend to collect this data through semi-structured interviews during 2024. Further repeating this study on a regular basis will enable understanding if improvements in usability, over time has occurred.

Conclusion

This is the largest national survey across primary and acute care of EMR usability conducted in Australia. Our study highlights the importance of measuring clinician experiences of EMR usability. Clinicians' experiences vary, and while technical quality features and ease of obtaining patient information perceptions were positive, challenges related to learnability of EMR systems, collaboration and information sharing across sectors, task efficiency and support for completing routine tasks. Addressing these issues through targeted interventions is essential to enhance clinician satisfaction, reduce burnout and improve patient care. If the benefits of

EMRs are to be realised there are good reasons to attend to the usability challenges identified by clinicians. The EMR is the foundation for digital health and EMR systems that support clinicians to provide care, complete routine tasks, collaborate with patients and colleagues and prevent errors can enable Australia and other countries to progress a digitally enabled healthcare system.

Strengths

Comprehensive study of clinician perceptions of EMR usability in Australia.

Limitations of the study

The major limitation of this study is the sample size and whilst a range of techniques were used to reach clinicians working with EMR systems the results of the study should be considered with caution. Further in this paper we present the consolidated findings of clinician professions perceptions of the usability of the EMR systems they mainly use. It is known that nursing and medical perceptions of usability can vary from brand to brand of EMR and the sector where clinicians are working [27]. Further, different EMR brands provide varied functionality and interfaces that impact usability. The market share for EMRs in Australia is shared across a growing but relatively small number of vendors. Whilst we collected the name of the EMR system used and vendor and analysed this information we do not believe it is appropriate to report on this due to the sample size. This item was not mandatory in the survey and we used a free text box leading to inconsistencies in data capture. Responses were diverse and inconsistent reflecting subproducts of EMR vendors and did not always match brand names. In survey design we had included a list that resulted in > 30 vendor names across the acute and community sectors and decided to include a simpler question for respondents 'to enter the EMR system that

you MAINLY use in your clinical work? Include the name and vendor if known. We recognise this as an important data item and will work towards including this in future surveys.

While surveys provide valuable insights, they may not fully capture the challenges clinicians face when using EMR systems. As surveys rely on self-reported experiences and can be influenced by recall bias and subjectivity of respondents. The context of the clinical setting, specific tasks and workflows will vary and this may impact perceptions. Surveys also focus on specific aspects of usability in this instance technical quality, ease of use, benefits, collaboration and information sharing. Measuring perceptions of usability such as error tolerance (ie a system's ability to detect, prevent and recover from user errors) are more suited to measurement through a range of techniques, such as counts of errors and error recovery processes. This survey reflects the experiences of those clinicians who participated in the survey and may not reflect the views of all clinicians. Surveys offer valuable insights, combining them with other evaluation methods and considering contextual factors is crucial for a comprehensive understanding of EMR usability challenges.

Summary table

- There have been few National studies of clinician experiences of EMR usability in Australia published in the academic literature and poor usability has been identified in other countries.
- Clinicians reported that EMR systems exhibited technical stability, responsiveness, effective information sharing within the same health service, and support for obtaining patient information and preventing medication errors.
- Clinicians noted issues such as inefficiency in

routine task completion, learnability of EMR systems, and suboptimal information sharing between different health systems and with patients.

- The study's findings provide valuable insights for EMR system developers, vendors, and healthcare organisations. Addressing usability issues, particularly the lack of intuitiveness in EMR interfaces and support for clinical workflows, is crucial for improving data quality, reducing clinician fatigue, and enhancing overall well-being in a highly mobile workforce.

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Human Ethics and Consent Declaration

Ethical approval for the study was obtained from The University of Tasmania Human Research Ethics Committee (Project id: 28113). This research was conducted following the requirements of the Australian Code for the Responsible Conduct of Research (2018). National Health and Medical Research Council, Australian Research Council and

Universities Australia. Commonwealth of Australia, Canberra. Participation in the survey was voluntary and informed consent obtained from all respondents. A participant information sheet was embedded within the web-based survey. Respondents could exit the survey at any time with no data captured.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could appear to have influenced the work reported in this paper.

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Credit authorship contribution statement

SL: Conceptualisation, Methodology, Formal analysis, Visualisation, Writing – original draft, review and editing, Investigation, Validation. CB: Conceptualisation, Methodology, Formal analysis, Investigation, Writing – original draft review & editing, Validation. AO : Formal Analysis, Conceptualisation, Methodology, Writing - Review & editing. YP: Conceptualisation, Methodology, Writing - Review and editing. JR: Conceptualisation, Methodology, Reviewing. RO: Methodology, Reviewing and editing.

Availability of data and materials

Data is provided within the manuscript or supplementary information files.

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