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The use and perceived value of electronic health information resources by health care professionals in the field of medicine, pharmacy, and nursing in Jazan province, Saudi Arabia

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ABSTRACT

Background: Healthcare workers increasingly use Electronic Health Information Resources (EHIRs) to make evidence-based decisions. Our study was intended to assess the perception, attitude, and practice of healthcare professionals in medicine, pharmacy, and nursing regarding their perceived value and use of EHIRs.
Methods: We conducted an observational cross-sectional study using a pre-validated questionnaire among healthcare professionals in Jazan province from September 2022 to February 2023. We included healthcare professionals and interns with medical, pharmacy, or nursing degrees and excluded those who refused informed consent.
Results: We included fully completed data from 294 participants, with an actual response rate of just 80.1 %. Almost 87.41 % utilized the health information resources at their workplace, with UpToDate [39.45 %] and Medscape [67.01 %] being the most frequently used medical databases. The health facilities' access to electronic health resources significantly impacted healthcare professionals' [$p = 0.04$] and medical interns' [$p = 0.02$] roles. Faculty members felt the need to access electronic health information at their workplace [$p = 0.00$]. Lack of time to access electronic health information due to a busy schedule was a significant reason that impacted the attitude of medical professionals [$p = 0.008$] and nursing staff [$p = 0.025$]. An excessive amount of clinically unrelated data was the primary obstacle (181/294, $p < 0.0001$) in using electronic health information resources.
Conclusion: Our study showed the pattern of healthcare professionals using EHIRs in the Jazan province, Saudi Arabia. We believe the study's outcome can help increase the calibre of electronic health information services available to healthcare professionals and raise awareness of different EHIRs in improving clinical care.

1. Introduction

Electronic Health Information Resources (EHIRs) have become increasingly prominent among healthcare professionals in the fields of medicine, pharmacy, and nursing (Wozar and Worona, 2003; Roshanov et al., 2013). Examples of these resources include Electronic health records (EHRs), clinical decision support systems or point-of-care (POC) tools, and online medical databases (e.g., PubMed, MEDLINE, Embase). EHRs are digital repositories or collections of medical information about patients, consisting of a wide range of data such as demographics, medical diagnoses, medications, allergies, lab results, and imaging reports (Adler-Milstein and Jha, 2017; Menachemi and Collum, 2011). POC tools play a crucial role in assisting healthcare professionals in making informed and evidence-based decisions at the point of care (Rui et al., 2023). For instance, UpToDate and Medscape are POC tools designed for medical specialities, while Epocrates and DynaMedex (DynaMedex formerly known as DynaMed and Micromedex) are tools built for pharmacists.

EHIRs enable more accessibility to patient data, real-time updates on medical guidelines and research, informed clinical decision-making, and

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simplified communication amongst interdisciplinary healthcare teams (Adler-Milstein and Jha, 2017; Roshanov et al., 2013; Wozar and Worona, 2003). However, the implementation and adoption of EHIRs pose many challenges, including interoperability issues, data security concerns, and potential disruptions in workflow (Adler-Milstein et al., 2017). Additionally, healthcare professionals must maintain a critical mindset while utilizing these resources because they present an overwhelming amount of information, making it challenging for healthcare professionals to appraise evidence critically, apply it to specific patient contexts, and seamlessly integrate it into their clinical decision-making process (Aungst et al., 2014; Horsley et al., 2011). Efforts are ongoing to filter information and optimize the benefits of using EHIRs in healthcare practice. For example, POC tools provide filtered information by various components, such as levels of evidence, rating scales or grade recommendations, and citations that refer back to the original research articles, systematic reviews, or guidelines.

The utilization of EHIRs by healthcare professionals in Saudi Arabia has witnessed significant growth in recent years. The country has made substantial investments in healthcare technology, leading to the widespread adoption of EHRs and other digital platforms (Al-Ghamdi, 2018; AlSadrah, 2020; Alshammari, 2021; Alzghaibi and Hutchings, 2022). There is a vast amount of information available on the internet for health care professionals. However, the extent of utilization of these EHIRs by healthcare professionals in the southern province of KSA is not known due to limited studies conducted in the area. Furthermore, the information regarding the availability of various sources of information utilized by healthcare professionals in the region through institution-supported resources is not well-documented. Nonetheless, understanding healthcare professionals' utilization patterns and perceptions of EHIRs in Jazan province, Saudi Arabia, is crucial for effective resource investment decisions. Hence, this study was envisaged to assess the perception, attitude, and practice of healthcare professionals in the field of medicine, pharmacy, and nursing regarding their perceived value and use of EHIRs.

2. Materials and methods

2.1. Study design and setting

We conducted an observational cross-sectional study using a validated questionnaire from 1st September 2022 to 28th February 2023 among healthcare professionals (medicine, nursing and pharmacy) associated with major hospitals and teaching institutions in Jazan province.

2.2. Study population and sample size

We used the non-probability convenience sampling method to enrol the study participants. We included healthcare professionals and interns with medical, pharmacy, or nursing degrees in the Jazan area. Those working in healthcare facilities outside Jazan and refusing to give informed consent were excluded.

We used the Open Epiinfo 7 software to calculate the sample size using the following formula:

$\underline{n = [DEFF * Np(1-p)]/[(d2/Z2\ 1-\alpha/2 * (N-1) + p * (1-p)]}$, where "n" denotes the calculated sample size, "N" the total study population size (7802 health care professionals (Ministry of Health. Statistical Yearbook, 2021), "DEFF" indicates the design effect (1 %), "p" = anticipated percentage frequency of the outcome factor in the population (considered to be 50 %), and "d" is the confidence limit with a margin of error of 5 per cent. We obtained a sample size of 367 and enrolled the same number of healthcare professionals from the region. However, only 294 participants fully completed the questionnaires, allowing an effective response rate of 80.1 %. The partially filled questionnaires were excluded from the analysis.

2.3. Study procedure and data collection tool

We assessed all enrolled patients to determine their eligibility to participate in the study. A validated English questionnaire was then given to those who met the eligibility requirements to collect information on their demographic characteristics, work history, professional experience, perception, attitude, and practices of using electronic health care information in their workplace. Two authors (SJM and RR) independently validated the questionnaire, with four domains (Demographic details, Opinion, Attitude and Practice) and 50 questions (20, 5, 7 and 18 for the domains, respectively), and the interrater agreement was tested using Cohen kappa (0.78). Each question was rated on a Likert scale. The alpha model tested the reliability analysis of all questions. All the domains demonstrated a good or excellent value of Cronbach's alpha (above 0.8).

2.4. Statistical analysis

The incomplete responses were not included in the analysis. We used both descriptive and inferential statistics for data analyses. The normal distribution of data was verified using the Shapiro-Wilks test of normality. Continuous variables were represented as Mean (Standard Deviation [SD]) and categorical variables as frequency (percentage). The difference in proportions between categorical variables was assessed using the Chi-Squared test and Fisher's exact test (if the expected observation in a cell was less than $n = 5$). The adjusted odds ratio (aOR) with 95 % confidence intervals (CI) to ascertain the impact on opinion, attitude and practice question responses of study participants from the field of medicine, pharmacy and nursing using regression analysis was estimated using Binary logistic regression. All hypothesized confounders were subject to univariate analyses, and those with p-value < 0.2 were included in the multivariable analysis. All analyses were done at 5 % significance using Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC.

2.5. Ethics statement

We obtained ethics clearance from the Institutional Ethics Committee of Jazan University. All prospective participants provided written informed consent before enrolling in the study. Privacy and confidentiality of study participants were maintained throughout the study. The pertinent information was gathered using a pen-and-paper case record form, which was subsequently converted to digital form using Microsoft Excel (Publisher: Microsoft Corporation, Redmond, Washington, USA, 2016). To maintain anonymity, we kept participant files in locked cabinets and digital data on a password-protected computer.

3. Results

3.1. Demographic characteristics of study participants

A total of 367 healthcare professionals from the Jazan area were requested to participate. The questionnaire was fully completed by 294 participants, yielding an actual response rate of just 80.1 %. In the study sample, 51.36 % (151/294) were males and 48.63 % (143/294) were females. The majority of them belonged to the 20 to 30 years age group (50 %) and had less than ten years of professional experience (68.3 %). The professional roles were an intern (20.40 %), faculty member (16.32 %), health care professional (63.27 %) from different fields of work, including medicine (28.57 %), pharmacy (39.45 %) and nursing (31.97 %). Over one-third of the participants had a bachelor's qualification [36.73 %] working at the primary health centre (19.04 %), general hospital (50.34 %), specialist (7.82 %), private hospital (9.86 %) and teaching hospital (12.92 %) [Table 2].

3.2. Knowledge assessment of the study participants

Almost 268/294 [91.15 %] of the study were aware of the electronic health information resources. Nearly two-thirds of the study participants [184/294; 62.58 %] committed that their healthcare facilities provided EHIRs. Over two-thirds [198/294; 67.34 %] accepted that they need electronic health information resources at their workplace. Almost 257/294 [87.41 %] stated that they had utilized the health information resources at their workplace. The majority of the study participants [268/294; 91.15 %] believed that using EHIRs was valuable and provided better patient care.

3.3. Different specialities and roles of healthcare professionals and their impact on the use and perception of EHIRs

On multivariable regression analysis, awareness about EHIRs was significantly higher among those qualified in nursing [0.02] and pharmacy [p = 0.01], which may be due to their greater need to use these health sources. The health facilities' provision of access to electronic health resources had a significant impact on healthcare professionals [p = 0.04] and medical interns [p = 0.02] roles. In contrast, faculty members felt the need to access electronic health information at their workplace [p = 0.00], indicating they are more engaged in acquiring up-to-date information to create notes and educate the students [Tables 1 and 3].

UpToDate [p = 0.003] and Micromedex [p = 0.00] were mainly accessed by nursing staff. UpToDate [p = 0.03] was the preferred tool by the pharmacists. The laptops and notebooks were frequently used by the nursing [0.002] and medicine field [p = 0.001]. EHRs were mostly used by nurses to get drug information [p = 0.006], rare disease information [p = 0.047], and for CME [p = 0.007]. Similarly, the pharmacists referred to EHRs for drug information [p = 0.008] and CME [p = 0.005].

Table 1
Impact on opinion, attitude and practice question responses of study participants from field of medicine, pharmacy and nursing using regression analysis (N = 294).

Domain	Parameters	Medicine (N = 84)			Pharmacy (N = 116)			Nursing (N = 94)		
		AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value
Impact of field medicine, pharmacy and nursing on opinion-based question responses of study participants										
O1	Do you know about EHIR	2.65	0.55–12.76	0.22	6.83	1.59–29.31	0.01	7.09	0.55–8.66	0.02
O2	Does your institute provide EHIR	1.15	0.46–2.86	0.75	0.93	0.25–1.55	0.88	0.23	0.44–1.23	0.88
O3	Do you feel the need to use EHIR	0.40	0.15–1.02	0.05	0.63	0.25–1.55	0.31	3.78	0.16–1.44	0.15
O4	Have you ever used EHIR at your institute	0.68	0.22–2.07	0.50	0.52	0.17–1.58	0.25	1.34	0.23–2.42	0.51
O5	Do you think EHIR is useful for better patient care	0.46	0.11–1.80	0.26	0.71	0.19–2.67	0.62	1.28	0.33–3.33	0.52
Impact of field medicine, pharmacy and nursing on attitude-based question responses of study participants										
A1	Critical skills to needed to assessthe quality of information available	0.57	0.23–1.40	0.22	0.90	0.39–2.08	0.82	1.73	0.26–1.62	0.41
A2	Improve patient outcomes	1.45	0.37–5.71	0.59	2.01	0.53–7.51	0.29	1.10	0.36–5.87	0.57
A3	No time to access in busy schedule	2.04	1.20–3.48	0.008	1.38	0.81–2.33	0.23	7.37	1.69–8.66	0.02
A4	Prefer to use electronic Drug information resources	1.31	0.74–2.28	0.34	1.06	0.60–1.87	0.82	1.00	0.78–2.98	0.61
A5	Huge amount of health information available electronically	0.54	0.27–1.07	0.08	0.52	0.26–1.01	0.05	4.58	0.22–6.54	0.10
A6	Helpful but not practical	1.04	0.65–1.07	0.84	0.97	0.61–1.56	0.92	0.09	0.66–1.67	0.95
A7	Do not need to use health information resources	0.75	0.48–1.18	0.22	0.51	0.31–0.82	0.006	7.87	0.22–8.65	0.02
Impact of field medicine, pharmacy and nursing on practice-based responses of study participants										
P1	Use of EHIR in practice	0.77	0.30–1.97	0.59	0.31	0.11–0.85	0.02	5.71	0.55–6.78	0.05
P2	To access Desktop/ Computer	0.79	0.36–1.72	0.55	0.71	0.32–1.57	0.40	0.73	0.44–2.37	0.69
P3	To access Laptop/ Notebook	4.18	1.79–9.73	0.001	2.43	1.08–5.44	0.03	12.11	1.78–16.74	0.002
P4	To access Tablet	0.85	0.34–2.16	0.74	1.61	0.62–4.17	0.32	1.87	0.33–5.46	0.39
P5	To access smartphone	1.59	0.64–3.93	0.31	0.53	0.21–1.35	0.18	5.19	1.12–6.18	0.07
P6	To refer Up-To-Date	0.35	0.15–0.81	0.01	1.26	0.52–3.05	0.59	11.44	0.55–12.66	0.003
P7	To refer Medscape	0.34	0.14–0.83	0.01	0.65	0.27–1.55	0.33	5.85	0.87–6.65	0.05
P8	To refer Epocrates	0.35	0.08–1.59	0.17	0.23	0.05–1.11	0.06	3.75	0.88–6.54	0.15
P9	To refer Lexicomp	0.98	0.28–3.37	0.98	0.41	0.13–1.33	0.13	3.29	0.33–4.66	0.19
P10	To refer Micromedex	0.71	0.21–2.35	0.58	0.09	0.02–0.28	0.00	27.07	0.22–28.22	0.00
P11	To assist diagnosis	0.95	0.50–1.78	0.88	2.16	1.21–3.84	0.008	10.38	0.56–12.22	0.006
P12	search treatment options	0.81	0.41–1.59	0.54	0.7	0.36–1.41	0.33	0.95	0.41–0.29	0.62
P13	search rare disease information	0.72	0.36–1.43	0.35	1.6	0.83–3.14	0.15	6.11	0.44–10.66	0.04
P14	Search drug information	1.41	0.68–2.95	0.35	0.62	0.31–1.27	0.19	5.41	0.55–9.23	0.06
P15	For patient education	0.87	0.44–1.71	0.69	0.81	0.41–1.59	0.54	0.38	0.33–2.73	0.82
P16	For Continuing medical education	1.3	0.63–2.68	0.47	2.77	1.36–5.63	0.005	9.89	0.63–10.11	0.007
P17	For teaching purpose	1.71	0.87–3.38	0.11	0.94	0.48–1.86	0.87	4.27	0.88–6.73	0.11
P18	For research purpose	0.61	0.31–1.20	0.15	0.62	0.32–1.22	0.16	2.57	0.23–5.27	0.27

Table 2
Impact on opinion, attitude and practice question responses of study participants working at various places PHC, GH, Specialist hospital, Private Hospital and Teaching Hospitals (N = 294).

Domain	Parameters	PHC (N = 56)			GH (N = 148)			Specialist (N = 23)			Private Hospitals (N = 29)			**Teaching Hospitals (N = 38)**		
		AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	**p Value**	**AOR [Adjusted Odds Ratio]**	**95 % Confidence Interval**	**p Value**
Impact of place of work on opinion-based question responses of study participants																
O1	Do you know about EHIR	0.49	0.03–6.81	0.59	0.24	0.01–3.28	0.28	7.2	0.37–139.54	0.19	0.52	0.02–13.69	0.69	7.91	0.02–10.01	0.09
O2	Does your institute provide EHIR	0.45	0.07–2.55	0.36	0.28	0.05–1.51	0.14	1.49	0.19–11.58	0.70	0.34	0.05–2.38	0.28	6.52	0.06–7.38	0.16
O3	Do you feel the need to use EHIR	0.34	0.05–2.07	0.24	0.18	0.03–1.06	0.05	0.03	0.004–0.37	0.005	0.007	0.00–0.13	0.001	22.57	0.01–24.66	0.00
O4	Have you ever used EHIR at your institute	0.04	0.0004–0.42	0.008	0.1	0.01–0.91	0.04	0.04	0.003–0.75	0.03	0.08	0.006–1.21	0.06	8.28	0.05–9.66	0.08
O5	Do you think EHIR is useful for better patient care	6.43	0.26–155.86	0.25	1.89	0.08–43.15	0.69	3.46	0.08–144.53	0.51	9.52	0.3–78.41	0.19	5.38	0.62–45.21	0.25
Impact of place of work on attitude-based question responses of study participants																
A1	Critical skills to needed to assess the quality of information available	7.27	0.62–84.08	0.11	11.35	0.99–129.21	0.05	0.02	0.001–1.17	0.06	4.87	0.11–1.11	0.26	10.76	0.01–11.22	0.02
A2	Improve patient outcome	0.15	0.01–1.85	0.13	0.64	0.07–5.44	0.68	0.36	0.10–1.32	0.12	0.6	0.41–6.42	0.71	8.47	0.33–10.44	0.07
A3	No time to access in busy schedule	0.72	0.27–1.89	0.51	0.36	0.14–0.92	0.03	1.76	0.41–7.64	0.44	0.34	0.16–4.39	0.07	8.87	0.55–10.22	0.06
A4	Prefer to use electronic Drug information resource	1.08	0.31–3.65	0.90	1.27	0.39–4.07	0.68	0.91	0.16–4.91	0.91	1.61	0.23–2.18	0.49	1.28	0.28–4.55	0.86
A5	Huge amount of health information available electronically	1.99	0.51–7.63	0.31	2.31	0.63–8.43	0.20	0.99	0.31–3.18	0.99	0.85	0.18–1.65	0.84	6.32	0.10–8.66	0.17
A6	Helpful but not practical	0.88	0.35–2.22	0.79	1.31	0.54–3.17	0.53	0.88	0.28–2.78	0.83	0.71	0.04–4.30	0.55	3.91	0.33–4.64	0.41
A7	Do not need to use health information resource	0.36	0.13–0.99	0.05	0.32	0.12–0.84	0.02	1.21	0.14–9.84	0.85	0.55	0.05–2.03	0.29	10.29	0.01–9.84	0.03
Impact of place of work on practice-based responses of study participants																
P1	Use of EHIR in practice	1.21	0.21–6.91	0.82	0.47	0.08–2.63	0.39	0.11	0.01–0.77	0.02	0.43	29.7–5667.3	0.47	3.87	0.22–4.56	0.42

(*continued on next page*)

Table 2 (*continued*)

Domain	Parameters	PHC (N = 56)			GH (N = 148)			Specialist (N = 23)			Private Hospitals (N = 29)			**Teaching Hospitals (N = 38)**		
		AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	**p Value**	**AOR [Adjusted Odds Ratio]**	**95 % Confidence Interval**	**p Value**
P2	To access Desktop/ Computer	0.35	0.07–1.71	0.19	0.42	0.09–1.94	0.26	81.97	5.83–1151.74	0.001	0.33	0.34–23.54	0.23	5.66	0.11–5.66	0.22
P3	To access Laptop/ Notebook	154.21	14.5–1640	0.00	237.2	23.69–2375.4	0.00	2.72	0.34–21.51	0.34	410.57	29.7–5667.3	0.00	47.82	0.01–1.88	0.00
P4	To access Tablet	0.72	0.13–3.91	0.71	1.44	0.30–6.89	0.64	0.09	0.008–1.11	0.06	2.84	0.34–23.54	0.33	3.78	0.55–1.88	0.43
P5	To access smartphone	0.29	0.05–1.72	0.17	0.13	0.02–0.75	0.02	0.20	0.02–1.59	0.12	0.15	0.01–1.31	0.08	7.30	3.33–22.1	0.12
P6	To refer up-to-date	0.15	0.02–0.86	0.03	0.13	0.02–0.68	0.01	0.55	0.06–4.83	0.59	0.48	0.06–3.54	0.47	9.76	4.55–11.33	0.04
P7	To refer Medscape	0.51	0.07–3.29	0.47	0.29	0.04–1.85	0.19	0.08	0.04–1.69	0.59	0.29	0.03–2.39	0.25	2.92	0.55–4.66	0.57
P8	To refer Epocrates	0.58	0.03–9.01	0.69	1.52	0.09–23.87	0.76	0.47	0.01–2.89	0.11	0.25	0.01–5.45	0.38	11.91	0.01–8.45	0.01
P9	To refer Lexicomp	1.65	0.18–14.63	0.65	0.33	0.04–2.39	0.27	0.25	0.002–0.42	0.25	0.37	0.02–5.6	0.47	6.83	0.44–8.66	0.14
P10	To refer Micromedex	0.05	0.006–0.49	0.009	0.06	0.009–0.53	0.01	0.38	0.023–0.63	0.009	0.22	0.01–3.14	0.26	10.96	0,01–5.66	0.02
P11	To assist diagnosis	0.13	0.03–0.51	0.003	0.07	0.01–0.27	0.00	0.47		0.01	0.11	0.02–0.55	0.006	22.46	0.01–6.66	0.00
P12	search treatment options	1.53	0.32–7.2	0.58	0.92	0.21–4.07	0.92	0.26	0.94–37.47	0.05	3.48	0.62–19.39	0.15	14.43	0.01–10.1	0.00
P13	search rare disease information	1.49	0.36–6.2	0.57	0.93	0.24–3.60	0.92	0.006	0.07–1.66	0.18	0.88	0.18–4.28	0.88	6.31	0.11–3.46	0.17
P14	Search drug information	3.07	0.64–14.65	0.15	4.45	1.00–19.78	0.04	0.15	0.25–12.65	0.56	4.64	0.81–26.68	0.08	5.62	0.0.44–11.45	0.22
P15	For patient education	0.08	0.02–0.38	0.001	0.21	0.05–0.87	0.03	0.88	0.04–1.4	0.11	0.15	0.02–0.86	0.03	13.43	0.46–11.77	0.01
P16	For Continuing medical education	7.84	1.62–37.99	0.01	7.31	1.6–33.49	0.10	0.08	1.06–37.66	0.04	3.48	0.57–21.24	0.17	10.57	1.66–33.45	0.03
P17	For teaching purpose	2.39	0.51–11.11	0.26	3.13	0.73–13.36	0.12	0.03	1.68–57.67	0.01	7.41	1.44–37.99	0.01	11.35	0.01–8.66	0.02
P18	For research purpose	2.64	0.59–11.89	0.20	1.77	0.43–7.28	0.42	0.17	0.09–4.07	0.02	0.93	0.17–4.9	0.93	6.44	0.59–12.44	0.16

Table 3
Impact on opinion, attitude and practice question responses of study participants from various roles of intern, faculty members and health care professionals (N = 294).

Domain	Parameters	Interns (N = 60)			Faculty members (N = 48)			Healthcare professionals (N = 186)		
		AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value	AOR [Adjusted Odds Ratio]	95 % Confidence Interval	p Value
Impact of field medicine, pharmacy and nursing on opinion-based question responses of study participants										
O1	Do you know about EHIR	0.80	0.16–3.88	0.78	1.07	0.21–5.51	0.93	0.09	0.45–6.52	0.95
O2	Does your institute provide EHIR	0.33	0.12–0.88	0.02	0.43	0.14–1.36	0.15	6.21	0.12–10.88	0.04
O3	Do you feel the need to use EHIR	1.7	0.65–4.40	0.27	9.26	2.76–31.09	0.00	15.25	0.75–20.2	0.00
O4	Have you ever used EHIR at your institute	1.93	0.62–6.02	0.25	1.49	0.36–6.21	0.57	1.38	0.64–6.55	0.50
O5	Do you think EHIR is useful for better patient care	0.85	0.18–4.02	0.83	1.65	0.32–8.56	0.54	0.45	0.22–10.22	0.79
Impact of field medicine, pharmacy and nursing on attitude-based question responses of study participants										
A1	Critical skills to needed to assessthe quality of information available	0.51	0.14–1.83	0.31	0.07	0.01–0.45	0.005	11.34	0.01–0.88	0.003
A2	Improve patient outcomes	3.13	0.81–12.0	0.09	2.83	0.61–13.09	0.18	3.73	0.84–8.22	0.155
A3	No time to access in busy schedule	1.02	0.6–1.75	0.92	2.07	1.12—3.80	0.01	5.79	0.64–10.12	0.05
A4	Prefer to use electronicDrug information resources	0.73	0.41–1.31	0.30	0.63	0.31–1.32	0.22	2.29	0.11–5.67	0.31
A5	Huge amount of health information available electronically	1.04	0.53–2.04	0.89	0.95	0.44–2.05	0.91	0.03	0.55–4.66	0.98
A6	Helpful but not practical	1.08	0.66–1.78	0.74	0.85	0.48–1.49	0.57	0.51	0.55–2.78	0.77
A7	Do not need to use health information resources	1.16	0.71–1.92	0.54	1.56	0.87–2.77	0.12	2.41	0.72–5.56	0.30
Impact of field medicine, pharmacy and nursing on practice-based responses of study participants										
P1	Use of EHIR in practice	0.92	0.29–2.91	0.89	0.75	0.24–2.26	0.61	0.26	0.55–1.46	0.87
P2	To access Desktop/ Computer	4.09	1.65–10.15	0.002	1.63	0.64–4.18	0.30	10.57	0.55–11.44	0.005
P3	To access Laptop/ Notebook	0.75	0.32–1.77	0.51	0.07	0.02–0.22	0.00	27.89	0.34–30.23	0.00
P4	To access Tablet	1.8	0.66–5.01	0.24	1.00	0.33–3.01	1.00	1.47	0.66–2.43	0.47
P5	To access smartphone	0.76	0.27–2.09	0.60	1.13	0.39–3.23	0.81	0.42	0.11–5.56	0.81
P6	To refer up-to-date	0.61	0.26–1.43	0.26	2.41	0.81–7.12	0.11	4.86	0.28–10.77	0.08
P7	To refer Medscape	0.75	0.3–1.91	0.55	1.39	0.45–4.29	0.55	0.84	0.38–3.45	0.65
P8	To refer Epocrates	0.61	0.26–1.43	0.45	0.77	0.16–3.55	0.74	0.59	0.33–1.22	0.74
P9	To refer Lexicomp	0.58	0.21–1.63	0.30	3.22	0.86–3.34	0.08	5.47	0.31–4.62	0.06
P10	To refer Micromedex	0.18	0.07–0.49	0.001	0.76	0.23–2.51	0.65	12.37	0.05–5.66	0.002
P11	To assist diagnosis	0.31	0.14–0.70	0.005	1.69	0.86–3.34	0.12	13.19	0.15–14.6	0.001
P12	Search treatment options	0.63	0.31–1.28	0.21	1.03	0.43–2.45	0.93	1.68	0.22–6.45	0.43
P13	Search rare disease information	2.19	1.09–4.39	0.02	2.2	0.94–5.11	0.06	7.41	1.06–10.65	0.02
P14	Search drug information	1.99	0.97–4.09	0.06	0.51	0.21–1.23	0.13	7.71	0.97–12.34	0.02
P15	For patient education	0.92	0.47–1.82	0.82	0.76	0.34–1.72	0.51	0.43	0.22–3.34	0.81
P16	For Continuing medical education	1.3	0.66–2.53	0.44	0.85	0.37–1.93	0.71	0.93	0.66–2.44	0.62
P17	For teaching purpose	0.76	0.39–1.47	0.41	0.57	0.24–1.34	0.20	2.03	0.49–6.87	0.36
P18	For research purpose	1.37	0.71–2.66	0.34	0.99	0.41–2.39	0.98	0.93	0.71–4.52	0.62

Desktops/Computers [p = 0.005], laptops [p = 0.00], and Micromedex [p = 0.002] were frequently used by healthcare professionals for diagnosis purposes [p = 0.001], acquiring information about rare diseases [0.02] and drugs [p = 0.02]. Interns mainly used Micromedex as a source of information [p = 0.001] for diagnosis purposes [p = 0.005] and accessing information about rare diseases [p = 0.02]. Faculty members used laptops/notebooks to access health information [p = 0.00] for all purposes, as shown in Tables 1 and 3.

3.4. Attitude of study participants towards the use of EHIRs

Lack of time to access electronic health information due to a busy schedule was a significant reason that had an impact on the attitude of medical professionals [p = 0.008] and nursing staff [p = 0.025] [Fig. 1]. However, pharmacists do not use EHR in daily practice [p = 0.006] [Table 1]. While skills required to access quality information were a major concern for those with health professionals [p = 0.003] and faculty members [p = 0.005] [Table 3].

3.5. Assessment of the usage and purposes of EHIRs

The majority of study participants [241/294;81.97 %] used EHIRs in their practice, with 120/294 [40.81 %] using it frequently, 110/294 [37.41 %] using it regularly or occasionally, and 64/294 [21.76 %] using it rarely or never. Smartphones [224/294, 76.19 %] were the most common utilized devices for accessing electronic health information resources at the work, followed by computer desktops [119/294, 40.47 %], laptops/notebooks [115/294, 39.11 %] and tablets [74/294, 25.17 %]. To find medical information on the necessary topics, the most frequently utilized medical databases were UpToDate [116/294, 39.45 %] and Medscape [197/294, 67.01 %]. The electronic health information resources were helpful at the workplace in assisting with diagnosis,

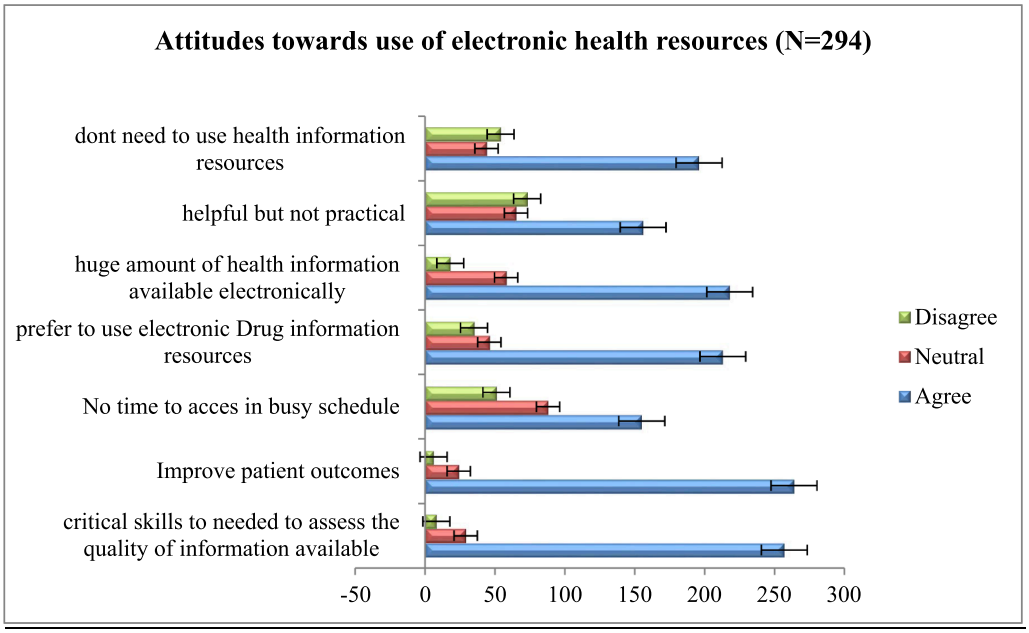

Fig. 1. Attitude of study participants towards use of electronic health information.

search for treatment options, rare disease information, and drug information, educating the patient in the best way, organising the continuing medical education and also in teaching and research activities (details are depicted in Fig. 2).

The main barriers to use electronic health information resources were as follows: too much clinically irrelevant information was found to be a statistically significant cause (181/294, $p < 0.0001$), unable to find information correctly (149/294, $p = 0.8$), time constraints due to work burden (154/294, $p = 0.28$), lack of awareness of available resources (152/294, $p = 0.45$), and lack of access to electronic resources (152/294, $p = 0.45$).

4. Discussion

In this study, we found that the majority of healthcare professionals (91 %) were aware of EHIRs; however, those with nursing and pharmacy degrees were more aware of the usage of EHIRs than medical professionals. Medscape and UpToDate were the most commonly used medical databases to find the needed medical information. Additionally, our study's findings align with a prior study that confirmed the adoption of EHIRs by Saudi Arabian pharmacists to get quick access to reliable information on herbal products and medications (Al-Arifi, 2013). Nonetheless, no statistically significant differences were found in the adoption of EHIRs by interns, faculties, and consultants or among

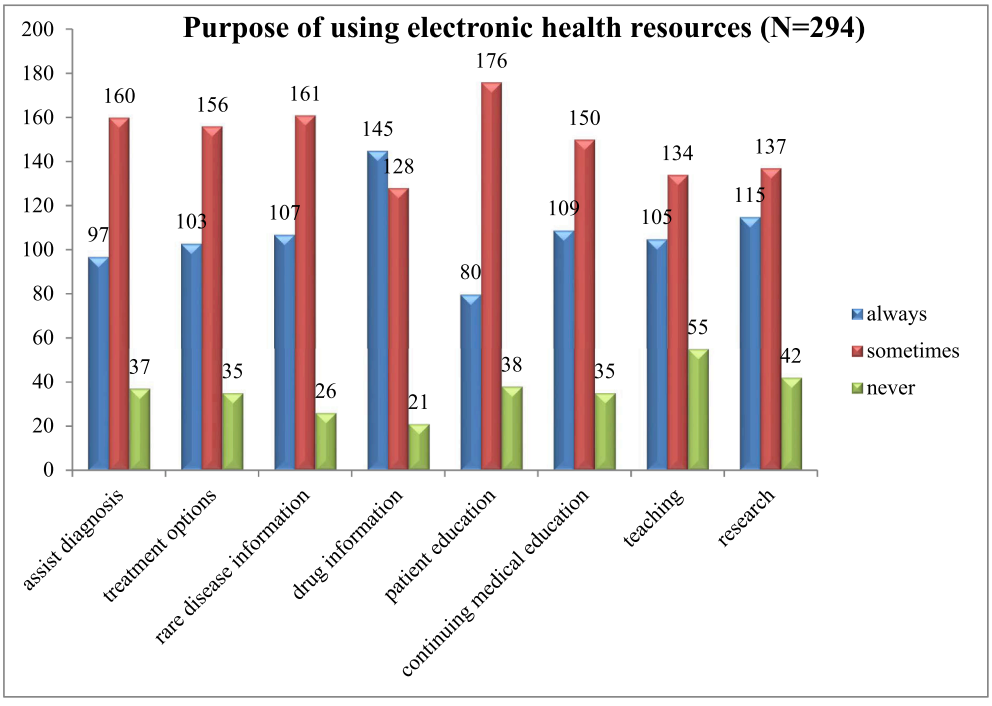

Fig. 2. Purpose of using electronic health information among study participants.

medicine, pharmacy, and nursing staff.

Several facilitators and barriers have been associated with the successful adoption and implementation of EHIRs in healthcare settings. Examples of facilitators include improved filtration and organization of patient information, which enable faster clinical decision-making and easy and seamless communication and data sharing for healthcare providers. Furthermore, improved search and data analysis capabilities within EHIRs are seen as facilitators because they allow initiatives for evidence-based practice and quality improvement (Casey et al., 2016). The results of our study are consistent with a previous study that investigated physicians' preferences for medical apps in Saudi Arabia (Al-Ghamdi, 2018). The physicians believed that the use of medical apps has a positive impact on improving patient care, education, and physician productivity.

On the other hand, we found that time constraints imposed by workload, the inability to locate information quickly, and an abundance of clinically irrelevant information were the main obstacles to using electronic health information resources in daily practice. This result is compatible with a study conducted in Ethiopia, which revealed that the majority of healthcare professionals experienced difficulties when utilizing EHIRs, such as inadequate computer skills, a lack of computer training, and limited familiarity with the electronic medical record system (Senishaw et al., 2023). Furthermore, technical challenges such as system compatibility issues and user interface complexity can impede health professionals' acceptance and proficiency in using EHIR systems (Dharmawan et al., 2022; Garavand et al., 2016; Rahal et al., 2021). Moreover, data privacy and security concerns may also act as barriers, as health professionals must adhere to strict confidentiality standards. Overcoming these challenges requires a combination of user training, availability of Internet connection and technical support, and ensuring that healthcare professionals can easily access and utilize these resources during patient encounters (Tesfa et al., 2021).

Our study and previous research have highlighted the potential advantages of EHIRs. These advantages encompass various aspects, including enhanced clinical outcomes (e.g., increased quality of care and decreased medical errors), organizational benefits (e.g., financial gains and operational improvements), and societal advantages (e.g., enhanced research capabilities, improved population health, and reduced costs) (Menachemi and Collum, 2011). Additionally, electronic resources allow healthcare professionals, including interns, faculties, and consultants, to stay updated about the latest research, guidelines, and evidence-based practices. However, factors such as the credibility and quality of online sources, information overload, and the need for critical appraisal skills to evaluate the validity and relevance of information can pose challenges. It is crucial for healthcare professionals to develop information literacy skills and critical appraisal abilities to ensure the appropriate and effective use of electronic health information resources (Al-Otaibi et al., 2022; Fiksdal et al., 2014; Maggio et al., 2019).

The strength of the study includes the robustly validated questionnaire that was used to collect data from a range of healthcare professionals working at different levels and at different phases of their careers. However, there are a few limitations to this study. First, data collection occurred through a one-time survey; hence, the responses might vary based on the improvement in EHIR use, experience, available resources, and technical support at the workplace. Additionally, selection bias, non-probability sampling, and potential differences in HCPs' orientation towards electronic health information use in the Jazan region compared to the rest of the kingdom may compromise the survey's generalizability and validity. Notwithstanding these limitations, the result of the study showed the pattern of using EHIRs by healthcare professionals in the Jazan province, Saudi Arabia. We believe that the study's outcome can help increase the calibre of electronic health information services available to healthcare professionals as well as raise awareness of different EHIRs in improving clinical care. Advancements, including the use of artificial intelligence-based natural language models such as ChatGPT (Rui et al., 2023), the integration of vital records for comprehensive data linkage, and the incorporation of emerging technologies like personal sensing will lead to more effective and efficient EHIRs.

To conclude, the future of EHIR holds promising opportunities for improved clinical care and population health in the Jazan province of Saudi Arabia. These advancements include the enhanced collection of social and behavioural measures, the integration of vital records for comprehensive data linkage, and the incorporation of emerging technologies like personal sensing. Furthermore, by leveraging these innovations, we can anticipate enhanced perceptions about EHIRs' use and value for providing fast and tailored answers to healthcare professionals' questions and helping them bridge knowledge gaps, facilitate continuous learning, and ultimately improve patient outcomes and quality of care.

Disclosures

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- Ethics approval statement – Institutional Research Review & Ethics Committee, Faculty of Pharmacy, Jazan University [Reference No: 2306/1507/39].
- Consent statement – Written informed consent was obtained from all participants.

Authors' contributions

- Saad S Alqahtani: Study conception and design, data collection, drafting manuscript.
- Santhosh Joseph Menachery: Study conception and design, data collection, drafting manuscript.
- Renju Ravi: Data collection, data analysis, drafting manuscript.
- Manal Almalki: Data collection, data analysis, drafting manuscript.
- Tahir Hakami: Data collection, data analysis, drafting manuscript.

All the authors have read and agreed on the final manuscript.

CRediT authorship contribution statement

Saad S. Alqahtani: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing, Visualization. **Santhosh Joseph Menachery:** Conceptualization, Data curation, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing, Project administration, Software. **Renju Ravi:** Data curation, Formal analysis, Methodology, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Tahir Hakami:** Data curation, Formal analysis, Supervision, Writing – original draft, Writing – review & editing. **Manal Almalki:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing.

Declaration of competing interest

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

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