DISSERTATION

ROLE OF ELECTRONIC HEALTH RECORDS FOR CHRONIC DISEASE MANAGEMENT- A SYSTEMATIC REVIEW

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INTRODUCTION

Multiple Chronic Conditions: A Growing Global Issue

1 in 3 adults worldwide suffer from two or more chronic conditions,[1] also known as **multiple chronic conditions (MCC)**. As the global population ages, the burden will continue to grow.

The patient experience

MCC has a profound impact on patients, leading to reduced quality of life, significant expenses, challenges with medication adherence, inability to work, and difficulties controlling pain and symptoms.[2,3] It also takes a considerable toll on caregivers.[4]

JOE, 62 YEARS OLD

- Diagnosed with **7 chronic conditions**– chronic lupus, arthritis, sleep apnea, chronic fatigue, depression, fibromyalgia, and chronic tendonitis
- Unable to continue working
- Experiences **pain** when he wakes up
- Stopped seeing friends and cannot participate in social activities
- **Prescribed up to 17 medications**, which he doesn't feel are very helpful and often doesn't take
- Feels managing his conditions has become a central part of his and his wife's lives

Most common global conditions[5]

- cardiovascular disease
- depression
- stroke
- diabetes
- lung cancer
- back and neck pain

Certain chronic conditions occur together more frequently, such as cardiovascular disease or stroke with depression.[6]

https://www.weforum.org/agenda/2017/12/healthcare-future-multiple-chronic-disease-ncd/

EHR and its role in chronic care and treatment- Depicting by a Use Case

USE CASES

PATIENT DIAGNOSIS
Leverage powerful algorithms to diagnose patients more quickly and accurately when early intervention matters

PATIENT SELECTION
Give providers the tools they need to quickly and accurately match individual patients with the right therapies

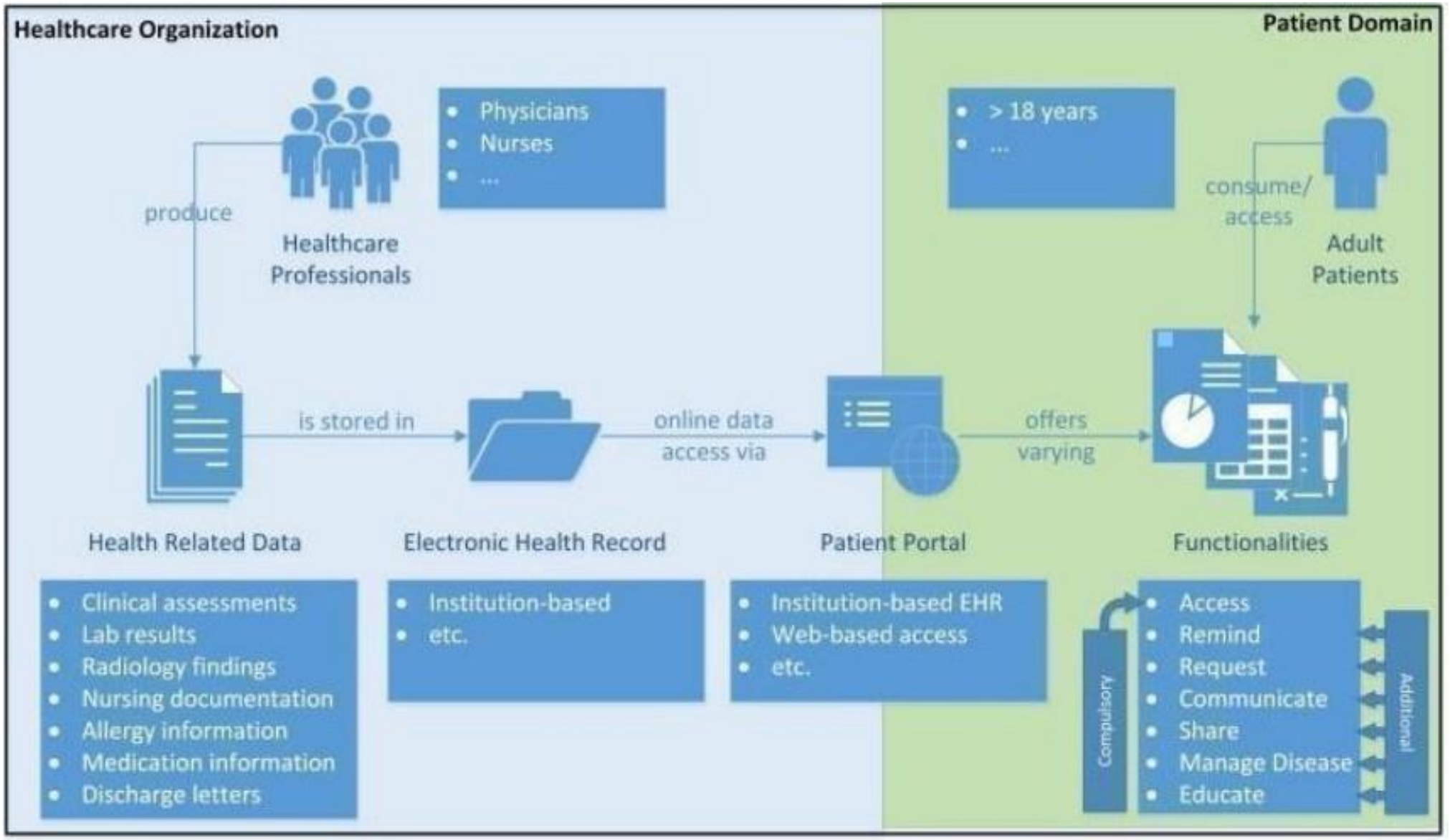
DOSE MANAGEMENT
Ensure optimal drug dosing and titration while increasing adherence, through early detection of missed doses or over-dosing to enable early provider intervention

PATIENT ADHERENCE
Unlock better patient adherence with innovative digital drug companion apps and Software as a Medical Device

DISEASE MANAGEMENT
Improve patient outcomes while driving care delivery efficiency for patients with chronic conditions

https://brightinsight.com/resources/digital-health-use-cases-powered-by-brightinsight

How EHR works in patient care and coordination



Ammenwerth E, Neyer S, Hörbst A, Mueller G, Siebert U, Schnell-Inderst P. Adult patient access to electronic health records. Cochrane Database of Systematic Reviews. 2021(2).

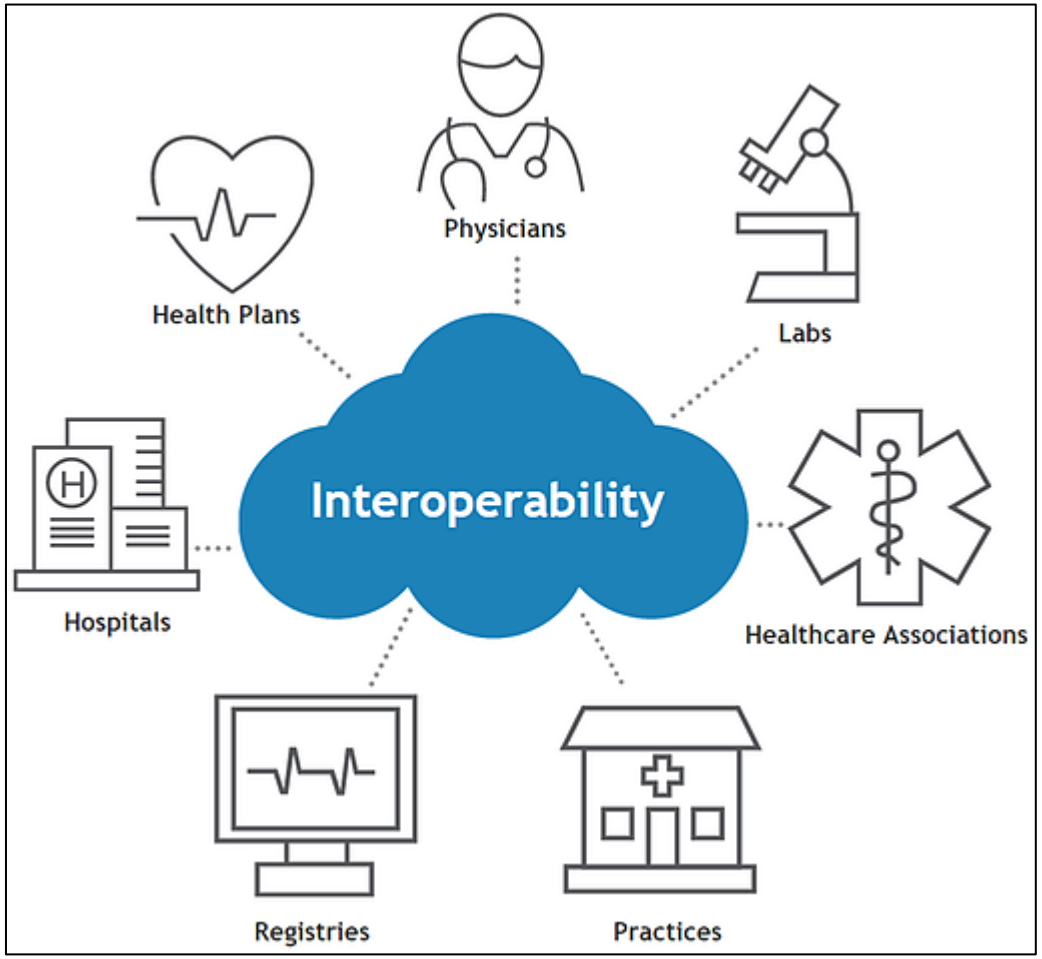
What are Electronic Health Records?

Electronic Health Records are patient charts in a digital format. They allow important patient information to be stored, updated and shared by healthcare and benefit providers.[1]

They can include:

- Medical History
- Immunizations
- Allergies
- Diagnoses
- Treatments
- Lab & Test Results
- X-rays
- Medications

EHR INTEROPERABILITY

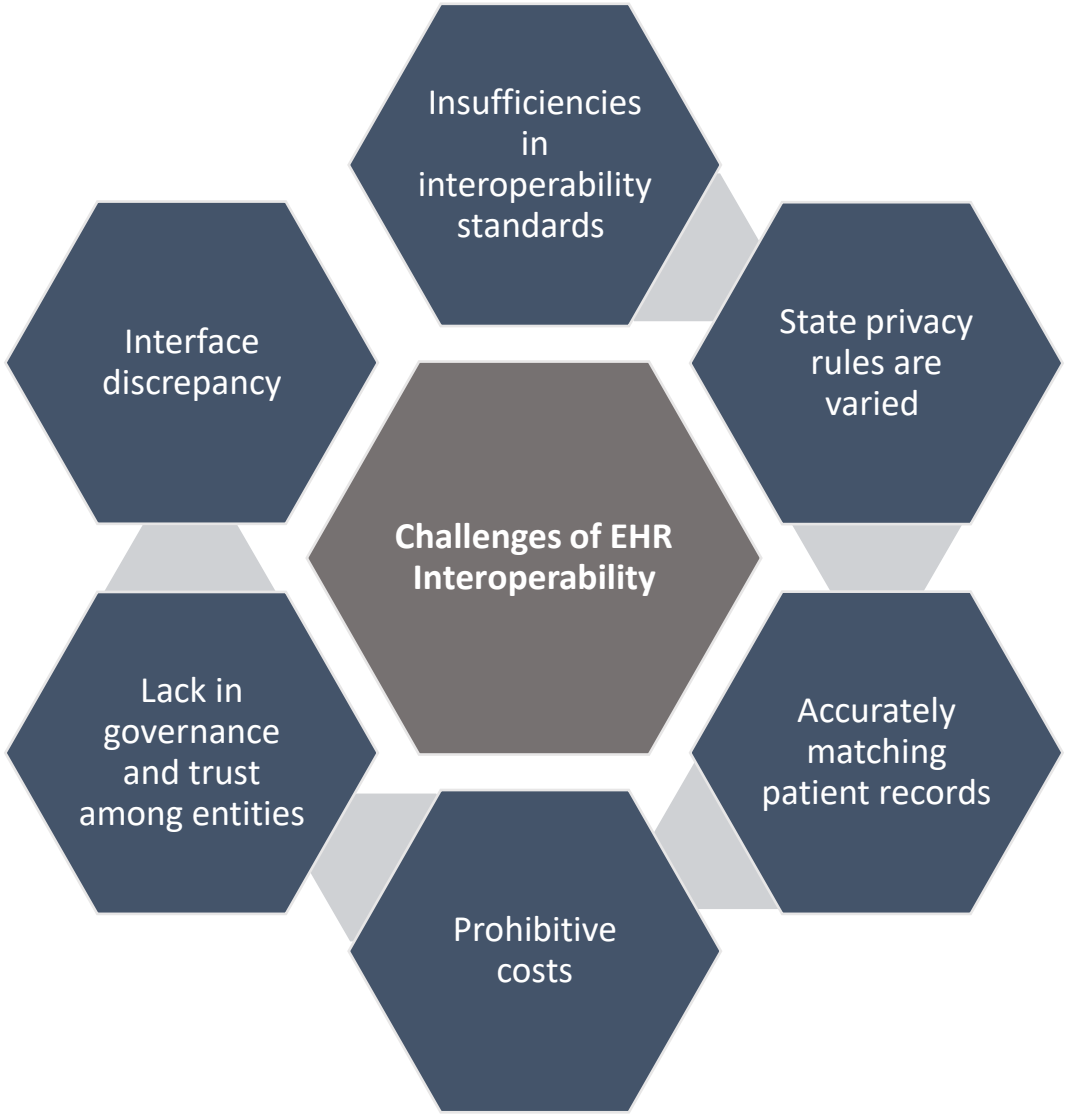


USE CASE

Grace is a citizen of Australia and she has visited India for her heart valve replacement surgery due to high treatment costs and long waiting period in her home country. She checked into one of the reputed hospitals in Delhi. She got admitted to the hospital and her surgery went smoothly. After recovery, she gets her discharge papers. She now asks the doctors to share all her test reports to share with her at-home care team. Is this possible? Will the doctors be able to deliver what Grace asked for? This is when we talk about EHR Interoperability.

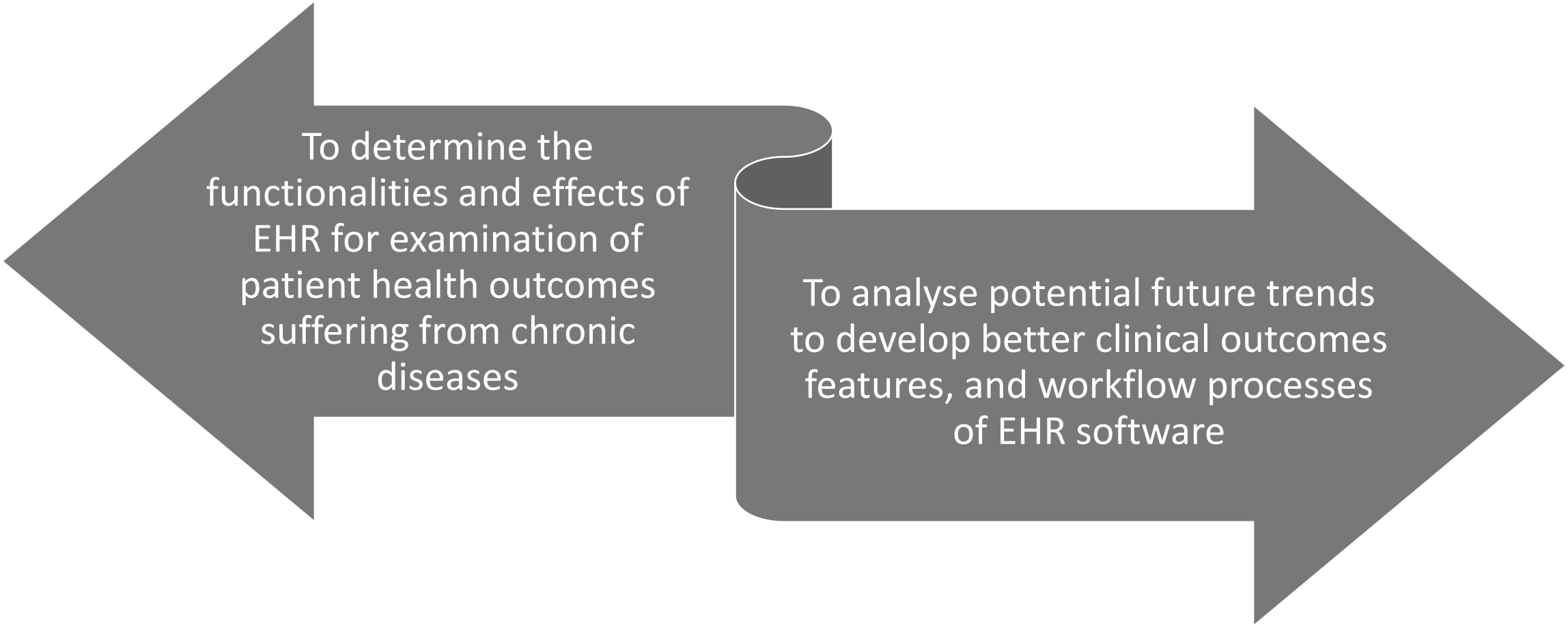
This is where interoperability comes in. Interoperability, is when multiple systems can share data that caregivers can use to inform patient care, this allows care teams to use the best tools to support their workflows regardless of the original source of data.

IMPORTANCE OF INTEROPERABILITY



https://medium.com/@mjpavlatos/ehr-interoperability-the-growing-mandate-in-healthcare-industry-2a144fe91378

AIMS AND OBJECTIVES



METHODOLOGY

A systematic literature review was undertaken on studies to explore the effectiveness of electronic health records for patients with chronic diseases. A grey literature search was conducted through PubMed from Jan 1, 2012 -Jan 31, 2022, using a combination of terms related to keywords ("chronic disease" OR "disease management") AND ("electronic health records" OR "Web-based Communication") NOT PHR NOT telemedicine NOT telehealth

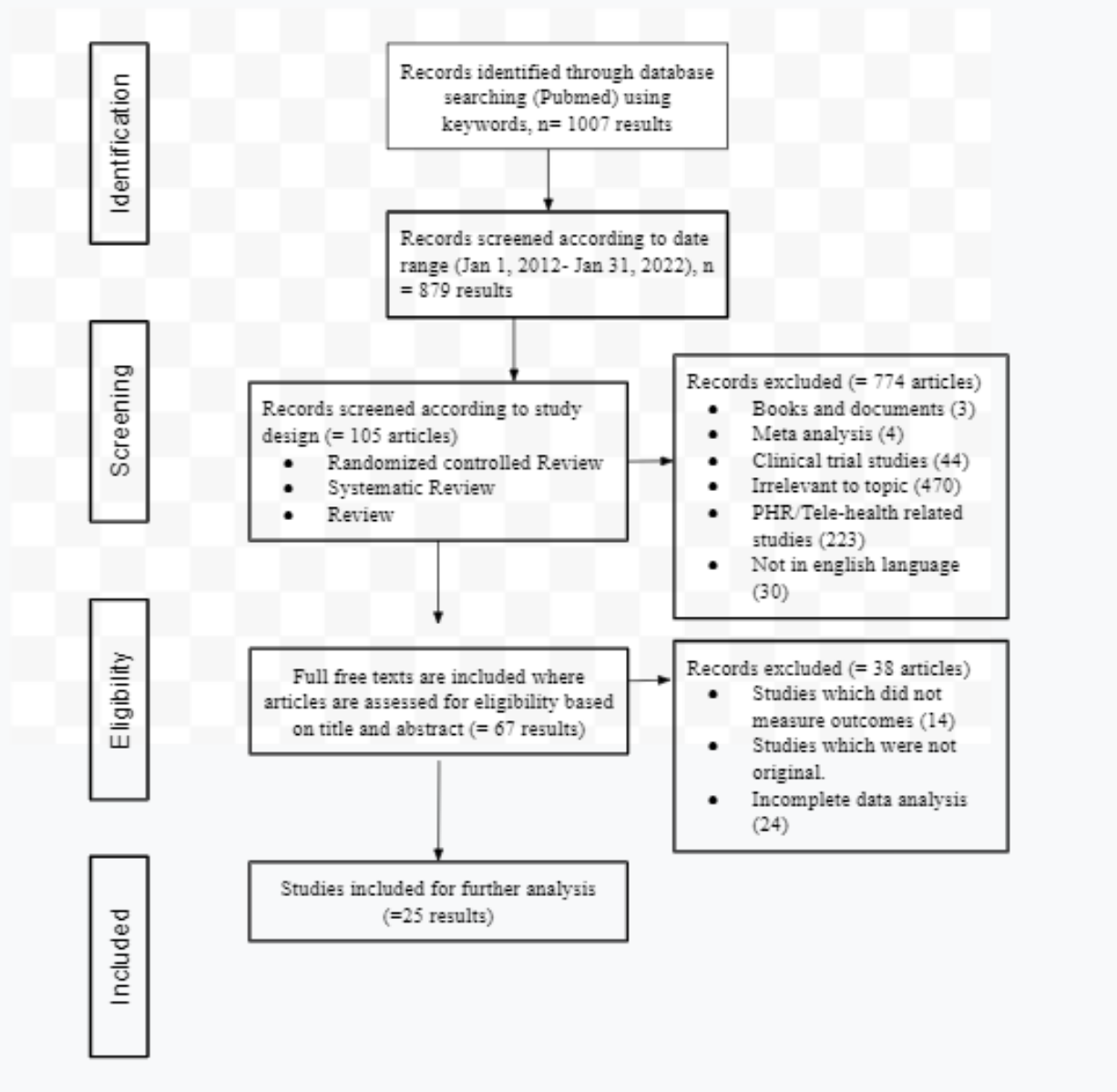


Figure. PRISMA flow diagram of article selection methodology

METHODOLOGY

Inclusion criteria:

I. Studies in the English language.
II. Studies between the date range: Jan 1, 2012-Jan 31, 2022.
III. For the purpose of documenting EHR outcomes, improving the care of patients with chronic diseases, and identifying their limitations, this research searches for randomized-controlled studies, review articles, and systematic literature reviews.

Exclusion criteria:

I. Studies that didn't record results.
II. Studies that lacked originality or shown insufficient data analysis
III. Research that was not written in English was rejected.
IV. Studies relating to PHR/Telehealth were disregarded.
V. Excluded publications, books, and meta-analyses related to clinical trial research.

Ethical Considerations of this review

- Data must be de-identified before releasing to the researcher.
- Consent of study subjects can be reasonably presumed.
- All sources will be properly cited and will be personally reviewed. The associated findings will be real, and the original data can be provided, on request, for inspection and validation of findings.

REVIEW OF LITERATURE

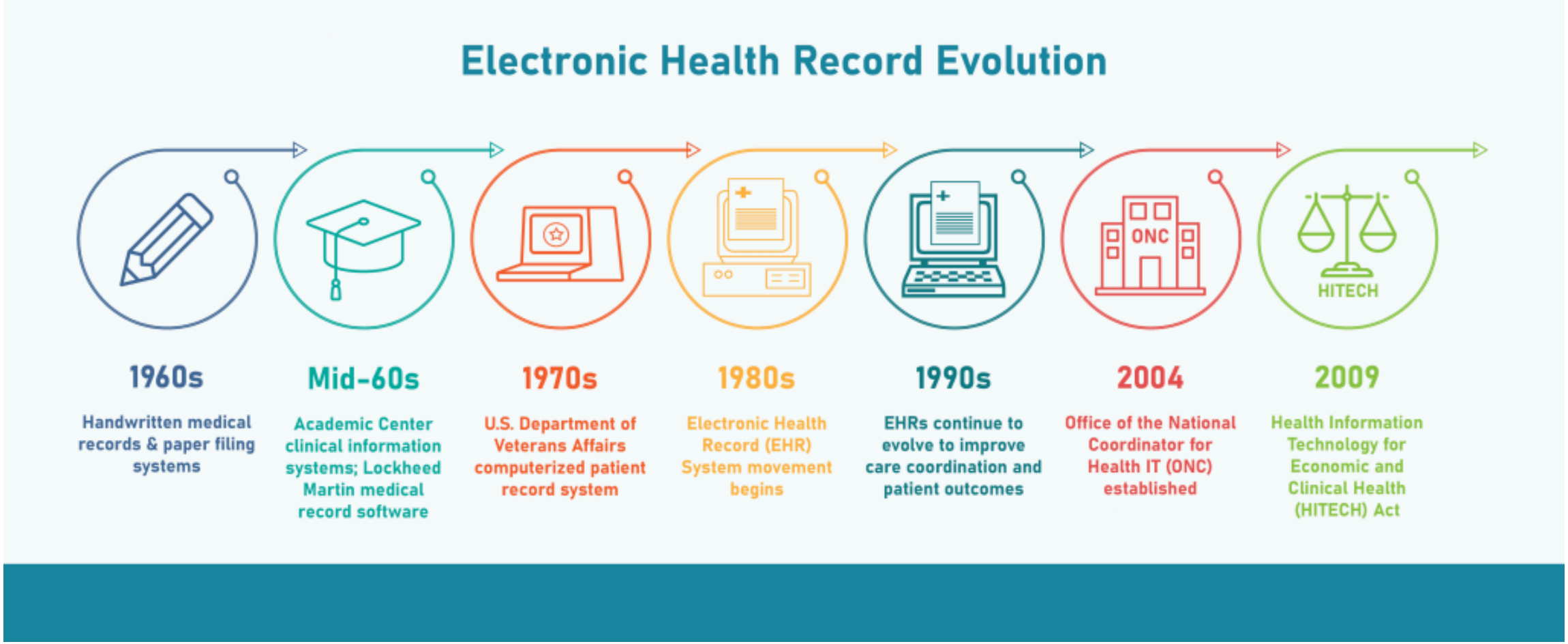


Figure. Evolving Landscape of EHR

REVIEW OF LITERATURE

Author, Year	Purpose of the Study	Study Design	Setting	Period of Study	Key Findings
Richter, J. G. et al (2016) **(16)**	The adoption of electronic health records in everyday patient care is one of the potential described in the article. It also emphasises patients' perspectives on electronic data gathering systems and their usage in everyday treatment, as well as patients' active participation in disease management using health information apps.	Article	Germany	2016	Structured, standardized, longitudinally built recording opportunities, as well as automated grading methods, have made long-term systematic patient-centered data collecting possible.
Yi, S. S., et al (2015) **(37)**	This study looks for the importance of EHR to assess the effectiveness of self blood pressure monitoring in controlling hypertension in minor, urban communities.	Randomized clinical trial	Community city clinics of New York City partnered with New York City Health department	June 7, 2010-October 7, 2011.	This study looked at the effect of giving self-blood pressure monitors to a mostly Hispanic,foreign-born, and uninsured populations and discovered that it was not more effective than usual care in these groups.
Robbins, T., et al (2018) **(26)**	This work first review the direct use of EHRs as a diabetes research tool. It takes into account the applications, constraints, and upcoming tactics. Identifying the gaps in the study literature and how to approach and get beyond obstacles to EHR research, also offers a significant benefit.	Systematic literature review	17 different countries	2006-2018	Large data sets are frequently included in published studies, although they are frequently constrained by issues with generalizability and missing values (many of which are necessary for research on diabetes). UK offers an intriguing and nearly unique context with national unique patient identities enabling large multi-centre sample sizes to overcome generalizability difficulties and maximize the clinical value of results.
Lewy, H.,et al (2019) **(23)**	The development and deployment of Personalized Health Systems in the Israeli healthcare system over the past ten years are illustrated in this article, together with the initiatives and infrastructures planned for R&D on PHS in the system's future.	Article	Israel	2018	The care provider is better equipped to recognize and treat patients with chronic diseases and offer individualized prevention utilizing electronic health records (EHRs) that incorporate predictive models for the likelihood of illness start deteriorating. Comorbid patients who participated in integrated telecare programs showed improved clinical results, self-management, and quality of life.

Refer for more studies to dissertation report titled “Role of EHR in Chronic Disease Management”. Page 13.

DISCUSSION

I. Evidence showing the functionalities of EHR

Manage Patient Demographics

(Capture and maintain demographic information. Where appropriate, the data should be clinically relevant, reportable and trackable over time)

Drug Interaction checking and specific dosing and warnings

(Identify drug interaction warnings at the point of medication ordering and present appropriate dose recommendations based on patient-specific conditions and characteristics at the time of medication ordering)

Manage problems and medication lists

(Capture, review, and manage medical procedural/surgical, social and family, patient-reported or externally available patient clinical history).

Inter-provider communication and secure data exchange

(Support secure electronic communication between providers to trigger or respond to pertinent actions in the care process, document non-electronic communication and generate paper message artifacts where appropriate)

Clinical Decision Support Systems

(The impact of computerized, knowledge-based CDSS on clinical results for patients with chronic diseases handled in primary care settings as well as patient-reported outcomes)

Manage Consent and Authorization

(Create, maintain, and verify patient treatment decisions in the form of consents and authorizations when required)

Notifications and reminders for preventive services and wellness

(Between healthcare encounters, notify the patient and/or appropriate provider of those preventive services, tests, or behavioural actions that are due or overdue)

Pharmacy communication

(Provide features to enable secure bidirectional communication of information electronically between practitioners and pharmacies or between practitioner and intended recipient of pharmacy orders)

Data Retention, Availability and Destruction

(Retain, ensure availability, and destroy health record information according to organizational standards This includes: > Retaining all EHR-S data and clinical documents for the time period designated by policy or legal requirement; >Retaining inbound documents as originally received (unaltered); >Ensuring availability of information for the legally prescribed period of time; and >Providing the ability to destroy EHR data/records in a systematic way according to policy and after the legally prescribed retention period)

DISCUSSION

II. Evidence showing the diminished role of present EHR systems

Using EHRs can be burdensome to doctors, who on average spend around 45 minutes on the computer per patient. This necessitates improvements that will make EHRs simpler and easier to use.

Electronic Health Records have a range of specialized workflow design options to implement HER in a way that will require time for setup by carefully planning it out

Many EHRs are thought to be non-intuitive and not user-friendly with way too many clicks that slow down patient care

EHR requires compatibility and interoperability requirements before integrating with third party systems to support seamless functionality across clinical and administrative tasks

Healthcare industry is in the middle of a transition to the new business model- change happening so gradually-it's difficult for vendors and providers alike to gauge the appropriate moment for a system redesign

III. **Future Opportunities**

Moving towards "plan-centric" EHR system

- **A library of care plans that covers a wide range of situations.** Variations in patient circumstances and preferences would dictate variations in the plans.
- **Algorithms to form a patient's master plan.** A master plan would combine appropriate algorithms for treating, say, a patient's asthma, arthritis, depression, and weight reduction, automatically resolving conflicts and redundancies.
- **Care team support.** Each team member — the patient's primary care provider, specialists, nurse practitioners, pharmacists, case managers and the patient — would see both the master plan and their own to-do list. Team members could assign tasks to one another.
- **Decision support and workflow logic.** The system must remind team members of upcoming and overdue activities, suggest changes in the plan when patient conditions and care needs change, and route messages to the appropriate team member regarding new test results or patient events.
- **The ability to traverse care settings, geographies, and different EHRs.** The plan would need to travel seamlessly with the patient. Providers would have interoperable systems that could integrate a patient's plan regardless of its origin.
- **Analytics for both individual patients and populations.** The system must be able to assess how well the plan is achieving its goals, both for the individual patient and for the larger population that may be under the provider's care. It should be able to apply lessons learned in treating one patient to other patients.

CONCLUSION

Metrics	Fee For Service (FFS)	Value-based care
Relevance	Conventional model	Disruptive model
Remuneration	Extent of service dictates fees	Fees depend on treatment outcome
Patient focus	Organizational incentives based on higher number of visits, tests, procedures; patient wellness not in focus.	Patients occupy the focus of care; holistic wellness trumps excessive treatment and profit.
Performance	No specific performance metrics	Well defined performance criteria

Health care delivery is in the early stages of an extraordinary change. This change is being driven by the relentless movement to the value-based care model and the problems exposed by the Covid-19 crisis. This ongoing transformation is paving the way for a new EHR design: a platform that fuses the current EHR with complementary systems, capabilities, and technologies.

Achieving the intelligent, plan-centric health care platform will require a level of industry cooperation that is unlike, and in some ways antithetical to, the way we've always done things.

The promise of EHRs to enhance chronic illness care and research has not yet been fully explored due to its limitations in design and implementation, particularly in our nation. If we want to raise the safety of diagnosis, it will be vital to understand and utilize the major benefits of the EHR that relate to diagnosis as well as comprehend and address any potential future drawbacks.

https://www.linkedin.com/pulse/john-glasser-proposes-intelligent-plan-centric-ehr-care-kambhampati

THANK YOU