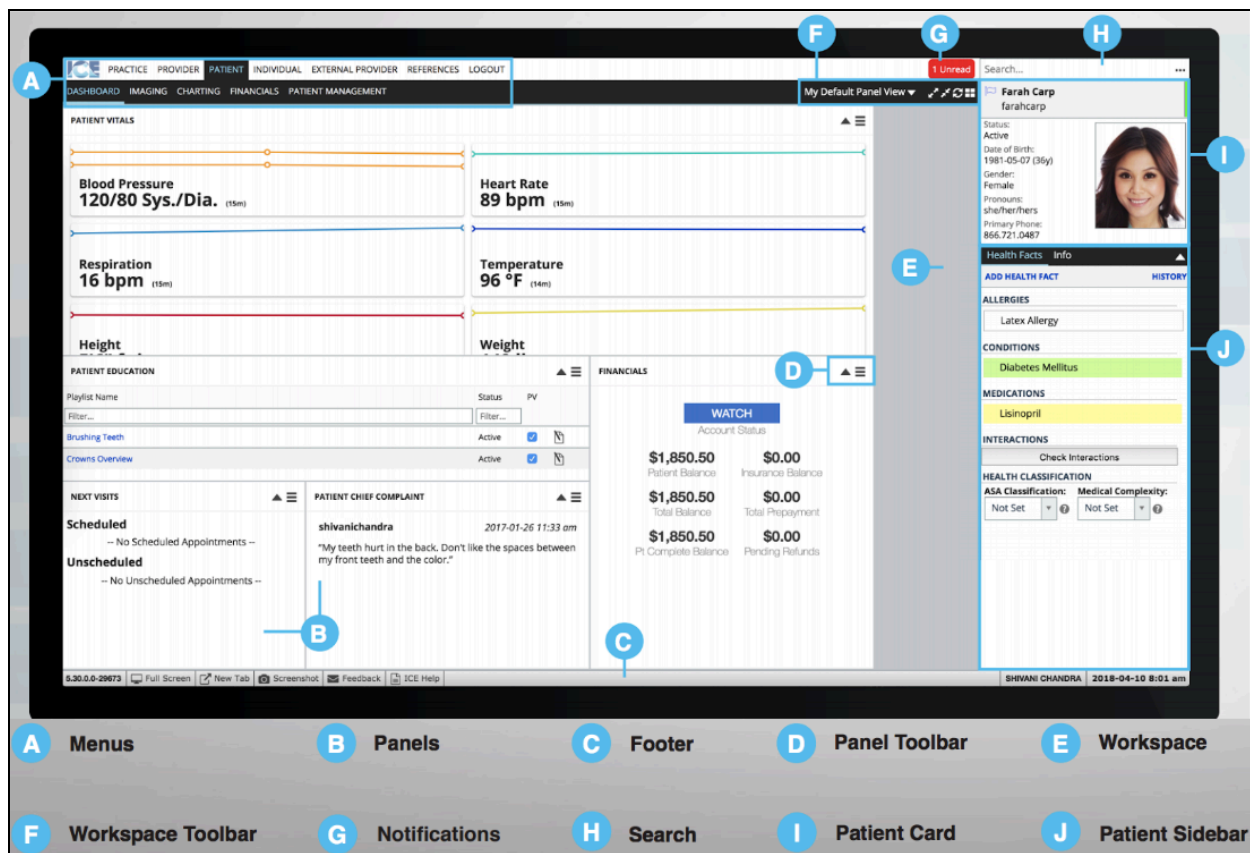

Reporting and Data Exposure with Comprehensive Health Records:

A Discussion for Healthcare Practitioners, Educators, Researchers and Policymakers

Background

A dynamic combination of knowledge, evidence, and timing enables high quality decision making, learning, research, and innovation, all of which are necessary for achieving excellence in healthcare.¹ Through the review of trends, patterns, correlations, and risk factors, the data available in Electronic Health Records (EHRs) provide the opportunity to influence clinical decisions, education, research, and health policies.²⁻⁶ Clinicians need easy and immediate access to quality information to make informed, evidence-based decisions regarding patient care. Better clinical decisions lead to lower costs and the potential for improved patient outcomes.⁷ Current clinical methods of analysing data are often onerous and perceived by healthcare professionals as providing little benefit to evidence-based decision making; ultimately wasting valuable time and detracting from patient care.^{4,8} A challenge in designing an efficient record-keeping system is the ability to report on clinical information in a standard way that is seamlessly integrated into the clinical workflow - without causing information overload.^{9,10,11} Understanding the value and capabilities of an EHR system creates potential for clinics to enhance care, learn and thrive. An optimal health record system will benefit patients, clinicians, service providers as well as population-based decision makers with the enhanced ability to collect, warehouse, analyse and share data within a streamlined workflow. It is suggested that the term "Comprehensive Health Record (CHR)" should be considered to represent this optimal system.^{12,13} The purpose of this article is to explore the components and significance of reporting with a new health records system and demonstrate the value of ICE Health Systems (ICE) to healthcare practitioners, educators, researchers and policymakers.



ICE Health Record System

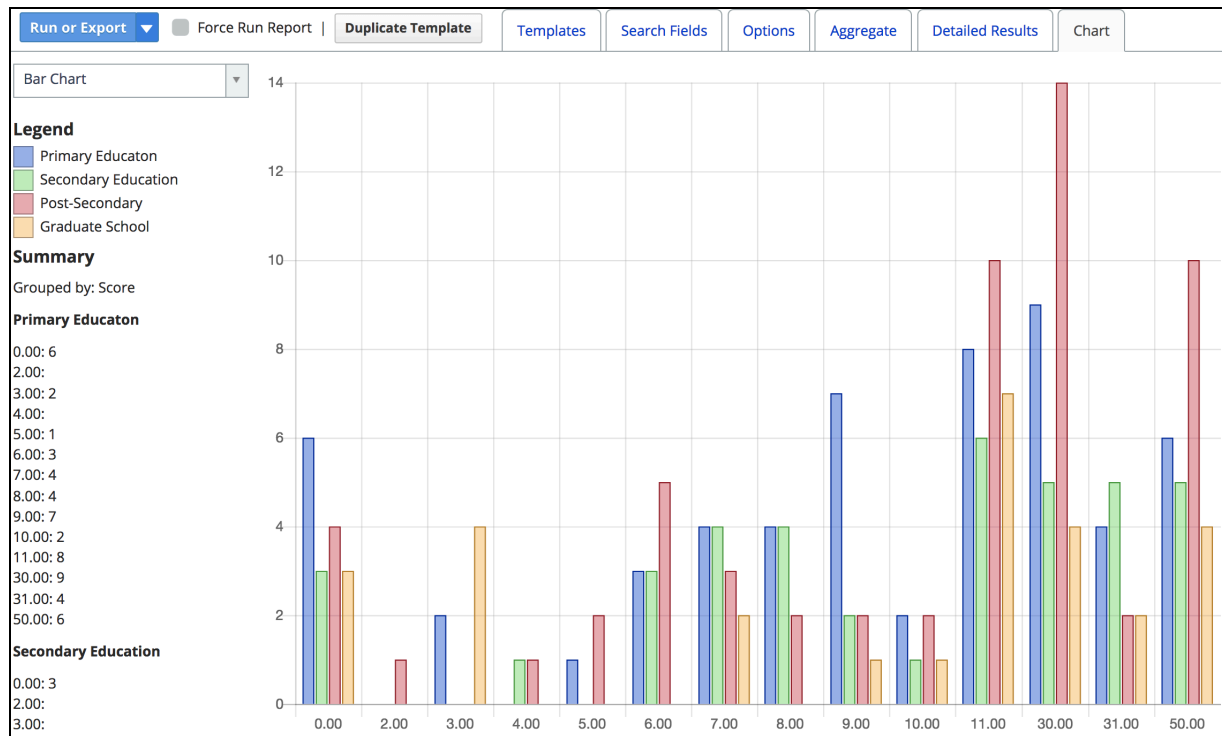
Quality Insights with ICE

[ICE Health Systems](#) (ICE) works actively with the [Collaboration for Health IT](#) (Collaboration) to bring this technology to the forefront of healthcare. ICE's comprehensive health record (CHR) system supports all aspects of healthcare; from the patient at the clinical level, to healthcare research at a global level. The goal is to increase data flexibility, entry, and accessibility in a single clinic or thousands of clinics around the world. Constant iterations and a vast database of

reporting templates have led to the development of a substantial library and data repository with unlimited storage potential. The reporting tool of ICE exposes all elements of the clinic and becomes a meaningful resource for clinicians and researchers. Creating automatic [reports](#) provides clinical and business intelligence insight, as well as the opportunity for clinics to become more efficient, effective and sustainable. Automating systems allow for better management of recalls, billing and

tracking. Customizable settings create dynamic presentation through inclusion of specific variables, elements and organization of the data. With real-time reporting, data continually updates as

new information is added. These features could improve the quality of information for decision making, while supporting knowledge development through enhancing learning and understanding.



Bar Graph Results of Report on Social Determinants of Health and Education Level

Data Exposure

The ability to access data and create reports easily and quickly supports learning and decision-making for all levels of healthcare, including patients, clinicians, educational institutions, payors and policymakers. The reporting function of ICE's CHR provides the opportunity for limitless data accessibility, as outlined in the chart below. This includes information on practice management, patients, conditions and treatment outcomes, documentation, clinical summaries, and accreditation.

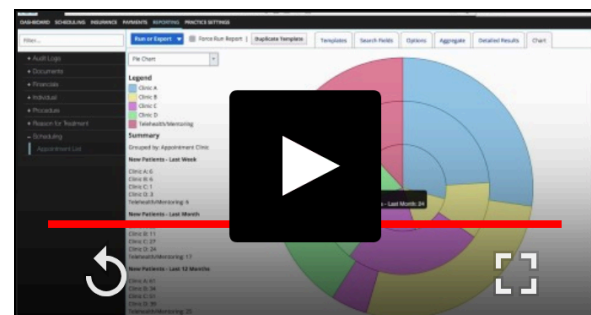
Practice Management	
- Scheduling ✓ Search and Filter by Appointment, Patient, Provider, Clinic, Procedure, etc	- New patients, no shows, cancellations - Wait time after patient check-in - Due for reminder call - Upcoming appointment - Unbooked recall - Outstanding treatment
- Finances ✓ Search and Filter by Payment, Insurance, Procedure, Patient, etc	- Accounts receivable balances, adjustments, income, and revenue - Charges by department
Demographics	- Average age of patients - Socioeconomic status (SES)
Patients	
- Medical alerts - Referrals in and out - Stage of treatment (including orthodontics) - Remaining insurance coverage	
Conditions and Treatment Outcomes	
- Smoking and periodontal disease - Diabetes and 3 month recalls - Hyposalivation and caries history	
Documentation	
Submission date / Assessment score / Specific answers to questions, etc	
Clinical Summaries	
- Provider login time and workstation - Learners assigned to instructors - Validation requirements - Treatments in progress	✓ Search and Filter by Patient, Provider, Department, Treatment, Tooth Surface, etc
Accreditation	
- Total number of patients - Treatments performed	✓ Search and Filter by Event, Patient, Provider, Clinic, Department, Time, etc

The results of these reports generate information to track patient conditions and outcomes, analyze patterns and evaluate situations in real-time. This supports the discovery of new health-related knowledge and may increase clinical evidence-based decision making. Results can be compared between individuals, departments, or clinics, as well as the option to analyze regionally, nationally and internationally. The insights generated by the systematic collection of structured data allow sophisticated analyses through the long-term study of patients for clinical outcomes and public health research.

Workflow

Generating insights with ICE Reporting is dynamic and comprehensive, and constantly expanding as new components are added. Each report type links to relevant search fields in a data set that can be used to create report [templates](#). Report templates allow regularly used reports to be run without the need to re-configure preferred search and display options.

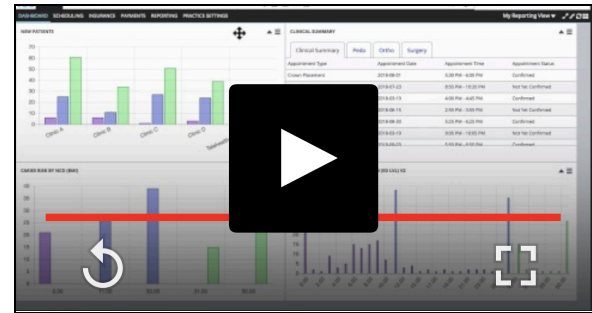
Within the Search Fields tab, creating additional data sets allows running and comparing multiple reports simultaneously as shown in the demonstration videos below. Report templates, as well as data sets, can be duplicated, renamed, shared or deleted. Content details, grouping, organization of columns, and order of display can be [customized](#) within the options tab of reporting. There are three report result views with the option to select one or all views for the generated report. The detailed view provides results in a table where all the columns selected are visible; the aggregate view groups results by a particular variable; and the chart view is a visual representation of the data, with the option to change graph type (pie, line, radar, bar, or polar area chart) in order to best represent the data, as demonstrated in the video below.



[Templates and Report Result Views Video](#)

Report Type	Example
Audit Log	Accreditation Requirements
Documents	Caries Risk Assessment Scores
Financials	Policy Holders
Individuals	Patients, Guarantors Providers, External Referring Providers, etc
Procedure	Planned Treatments of Specific Teeth or Surfaces
Reason for Treatment	Report on Treatment Plans
Scheduling	Practice Management

In addition to the results displayed in the ICE reporting area, they can also be viewed as an interactive or detailed list, or in a chart format on the Practice, Patient or Provider [dashboards](#) for quick access and review, as seen in the following video. These reports run automatically to provide insight into clinical activity, patient details, and financial progress. Multiple report panels can be added to the dashboard, with multiple data sets displayed in different tabs.



[Report Results in Dashboard Panels - Video](#)

Results from reports can generate custom [messages](#) that appear in the patient warnings and practice warnings panels. Warnings help to drive daily work and prompt actionable responses based on the report results. Messages can be configured as a forced warning with a pop-up window that must be acknowledged before continuing. Messages can be customized for different dashboard views. For example, a message to the administrator could be different than the message to the clinician, based on the same report.

Interoperability

Research suggests that comprehensive health records (CHR) and data-driven research improve the quality of care all over the world.^{14,15} Sharing data across various health professions (pharmacy, dentistry, medicine) and care providers (school health services, geriatric care,

emergency services) is a national priority and essential to connecting dynamic, multidimensional data sources of healthcare.¹⁶ There is limitless interoperability potential with ICE's standardized data collection, global reporting and real-time sharing. For example, report templates can easily be [shared](#) with other individuals within a clinic. Shared templates can be duplicated and modified to suit individual needs. The ability to access data through cloud-based technology from anywhere in the world provides opportunities for interprofessional education and practices to exchange health data within regional and international information systems.

Standards

All aspects of the system are tested, reviewed and improved consistently in order to provide the most comprehensive product. ICE deliberately focuses on increasing quality by adopting globally approved standards including:

Standards Developing Organizations (SDOs)

- HL7: Fast Healthcare Interoperability Resources Specification ([FHIR](#))
- American Dental Association (ADA): [Standards Committee on Dental Informatics](#)

- Standardized Dental Notations ([Universal, International \[ISO/FDI\], Palmer](#))

Privacy and Confidentiality Standards

- Health Insurance Portability and Accountability Act ([HIPAA](#)) in the USA and respective international legislation
- International Organization for Standardization ([ISO 27001](#))

Diagnosis Standards

- The World Health Organization (WHO) International Classification of Disease ([ICD-10](#))
- Dental Diagnosis System ([SNO-DDS](#))
- The International Caries Detection and Assessment System ([ICDAS](#))
- American Dental Association (ADA) Current Dental Terminology ([CDT](#)) Codes in the USA and respective international legislation

Contributors

ICE Health Systems is committed to working with leaders in healthcare to deliver an easy-to-use system, which improves patient care standards, streamlines professional workflow and contributes to the advancement of research. This CHR has been made possible through cooperative efforts, continual iteration and constant refinement, including working with healthcare professionals and educators internationally.



Dr. Lynn A. Johnson is Professor and Associate Dean for Faculty Affairs & Institutional Effectiveness at the University of Michigan School of Dentistry. Dr. Johnson is an academic author, international speaker and serves as the chair of the Collaboration for Health IT Advisory Board.



[Dr. Lynn Johnson Speaking on ICE Health Record System](#)

Conclusion

Data collection and analysis is a foundation of knowledge and health improvement. Insights created by this

wealth of information has the potential to impact all levels of healthcare, from clinical to education and policy. In future versions, ICE will expand on existing functions of reporting by examining employee health and environmental health levels. Providing sophisticated reporting on trends of health workforces within and across regional and international systems will assist with the World Health Organization (WHO) National Health Workforce Accounts goal to standardize health workforce information systems.

The Collaboration and ICE have developed a comprehensive health record (CHR) with maximum flexibility and organization to generate information that uses international standards to support patient care. The system is optimized for clinical use and research to maximize clinical efficiency, healthcare standards and global relevance.

For more information on other exciting components of ICE, please consult [these articles](#) and review the [Knowledge Base](#) website for more details.

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