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Benefits and Challenges of Transitioning Occupational Health to an Enterprise Electronic Health Record

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Objective: Occupational health (OH) documentation has traditionally been separate from health system electronic health records (EHRs), but this can create patient safety and care continuity challenges. Herein, we describe outcomes and challenges of such integration including how one health system managed compliance with laws, regulations, and ethical principles concerning digital privacy. **Methods:** Occupational health integration with the enterprise EHR at the University of California San Diego Health was started in June 2021 and completed in December 2021. **Results:** Integrating with the enterprise EHR allowed for a secure telehealth system, faster visit times, digitization of questionnaires medical clearance forms, and improved reporting capabilities. **Conclusions:** Integration and interoperability are fundamental building blocks to any OH EHR solution and will allow for evaluation of worker population trends, and targeted interventions to improve worker health status.

Key Words: electronic health record, challenges, digital privacy, occupational medicine, employee health, worker

Electronic health record (EHR) use is known to improve patient safety and quality of care, and its widespread adoption was stimulated by the Health Information Technology for Economic and Clinical Health Act passage in 2009.^{1,2} However, occupational health (OH) EHR integration with a health system's enterprise EHR presents a host of new challenges due to compliance with laws, regulations, and ethical principles concerning digital privacy.³ One high impact example is the Health Insurance Portability and Accountability Act of 1996 (HIPAA) that allows access to personal health information (PHI) only when the information is essential for the worker's employee-related health care. Therefore, a primary care provider's access to the entire EHR is distinctly different from that of an OH provider who requires a tailored view.⁴ Furthermore, access to the worker's genetic and disability history must be restricted in accordance with the Genetic Information Nondiscrimination Act (GINA) and Americans with Disabilities Act (ADA), which prohibits discrimination in hiring, firing,

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LEARNING OUTCOMES

1. Critically analyze current laws, regulations and ethical principles concerning digital privacy to successfully integrate occupational health electronic health records with health system's enterprise electronic health records.
2. Identify the elements of cross-departmental collaboration required for the transition to a fully integrated electronic health records to construct innovative solutions to barriers that separate electronic health records pose to OH patient care.

or promotion based on genetic information or disability.^{5,6} In response to these challenges, many OH solutions rely on stand-alone EHRs, population management using spreadsheets, and purchasing third-party workflow specific software that enable basic patient care and compile necessary reports to governmental agencies and for institutional audits.^{4,7}

The functionality limitations of OH specific EHRs were further highlighted during the COVID-19 pandemic—from challenges meeting a growing number of workplace injuries and illnesses to ordering COVID-19 testing to vaccinations to tracking those with potential exposures. The pandemic placed a particular strain on workers with non-fatal workplace injuries and illnesses in private industry increasing 32% compared with before the pandemic.⁸ Furthermore, COVID-19 became a major occupational exposure with healthcare workers representing up to 20% of infections in some states.⁹ This resulted in the need for quarantine, which propagated patient load and staffing shortages throughout the United States.¹⁰ Occupational health providers were constantly adapting to iterative COVID-19 guidelines to mitigate workplace spread of disease and maintain continuous delivery of health care for the public.¹¹ However, because of the lack of a standardized, interoperable, and adaptive EHR systems, the OH provider's ability to provide care and comply with population-level demands¹² and required robust data sharing resulted in further strain to the system with each variant.

The objective of this article is to describe the successful implementation of an integrated and interoperable OH EHR solution that is being used in the postpandemic world to meet the emerging requirements being placed on OH clinics, to report on benefits added to the organization, and to convey challenges that other occupational medicine clinics may encounter when facing a similar transition.

METHODS

Population and Setting

University of California San Diego Health (UCSDH) is a large regional academic health system composed of two acute care facilities with 799 beds, urgent care, ambulatory primary, and specialty clinics. UCSDH has used cross enterprise Epic EHR since 2015 and hosts two sister campuses (UC Irvine, UC Riverside). The UCSDH Center for Occupational and Environmental Medicine (COEM) provides

Methodology: Protecting Patient and Employee Information

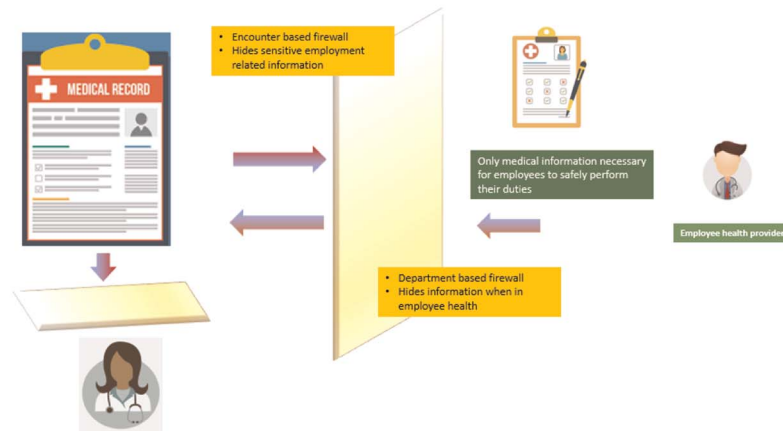


FIGURE 1. Graphical representation of limiting electronic health record access for employees in compliance with EEOC guidelines.

occupational medicine services to the UCSD Health System (22,833 employees), UC San Diego campus (27,161 employees), and local business clients (10,000 employees). The COEM services include the full scope of occupational medical services including employee medical surveillance, workers compensation care, postexposure management, onboarding exams, vaccinations, COVID response plan management, drug testing, hearing conservation, respirator clearance and fit testing, mass vaccinations, animal allergy, and researcher-related medical surveillance.

Prior Systems

Previously, the COEM concomitantly used several IT platforms including a standalone off the shelf occupational medicine EHR platform for documentation, home-grown systems for tracking immunizations, tuberculosis testing and mask fit, as well as Microsoft Access and Excel for needlestick tracking. The UCSDH Epic EHR was used in a limited capacity for transcribing laboratory and radiology orders. The use of multiple IT platforms required manual entry and double documentation as well as expensive maintenance. The transition of COEM to Epic EHR was deemed the most sustainable and efficient option for streamlined employee care and operations, decrease risk for transcription errors, or lack of knowledge at the right time.

Protecting Employee Privacy

In addition to HIPAA regulations, digital privacy for workers is also regulated by the US Equal Employment Opportunity Commission (EEOC), ADA, GINA, Occupational Safety and Health Administration (OSHA), local/state/federal regulations, and state specific worker's compensation programs. On May 31, 2011, the EEOC recommended the use of firewalls to limit employee EHR information to only job-related medical information.¹³ Title I of the ADA and Title II of GINA limit employer access to medical information. Regardless of whether an employer or an OH provider maintains information in paper or electronic files, it must ensure that PHI about applicants or employees cannot be accessed, except under certain circumstances. The EEOC stated that both the ADA and GINA require that an employer maintain confidentiality of employees' PHI, including electronic PHI. Moreover, although the ADA and GINA contain exceptions permitting disclosure, "none of these exceptions specifically authorize an employer to allow access to medical information related to employment by individuals providing health services unrelated to employment." Thus, the EEOC opined that the storage of PHI and OH information in a single EHR, especially any absent access limitations, may contravene the ADA and/or GINA. Before EHR integration, this was not a

concern because of complete separation of the two EHRs. However, in accordance with this recommendation, and following digital privacy requirements for employees, a firewall was developed within UCSD Epic (Fig. 1).

Privacy and compliance legal experts were involved during the entire implementation process, including firewall building and post implementation testing. The framework of the firewall was to protect sensitive employment information from the mainframe records and protect occupational medicine providers from seeing employee medical information not relevant to the employee safely performing their work duties (ie, vaccination, tuberculosis testing, employment-related medical exams, and drug testing).

Preparation for Transition and Leadership Engagement

A key difference in occupational medicine is that the type of medical services provided are geared by employers needs than individual patient needs. Specific types of specialty features include the ability to capture employer or services for medical surveillance, robust communication portal for work clearances to employers, federal or state required forms, ability to manage patient populations by employer, and payment structure to bill employer. Addressing this difference in needs required a diverse team with experts in occupational medicine, information technology and software development, risk management, and privacy and compliance experts.

The project team adopted a phased-approach for the transition, using LEAN and agile tools for discovery, scoping, analysis, delivery, and optimization. An executive committee of operational leaders oversaw the work of a steering committee, which, in turn, led and mobilized efforts via multiple workstreams (Fig. 2). Each workstream focused on specific aspects such as billing, privacy and compliance, reporting, and hardware. Some workstreams, such as clinical workflows, were broken down further into workgroups to better tackle specific areas such as immunizations, workers' compensation, clinical firewalls, employee onboarding, and surveillance workflows. Key stakeholders from various departments such as human resources, legal, risk, and compliance were engaged to identify key deliverables and buy-in during the scoping and development stages. A strong partnership between the COEM and information services teams has been the cornerstone throughout the process. During this time, a project timeline was constructed (Fig. 3).

Intradepartmental and interdepartmental input was incorporated thru the design of the build and implementation stages. End users' workgroups were developed for early engagement on design

Methodology: Team Formation

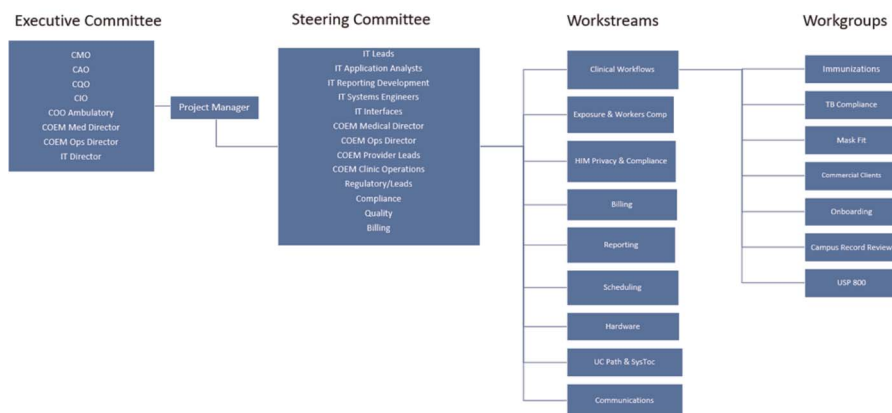


FIGURE 2. Graphical representation of team organization for Epic implementation.

and usability of streamlined processes. One challenge through the preparation stage was ensuring the end user (providers, operational staff, and key stakeholders) understanding of scope of work and limitations of existing Epic functionalities. As the Epic foundation build is for personal patient care, existing tools and functionalities were adapted for occupational medicine use and requirements. Key concept ideas and postdesign demos were performed for buy-in and feedback. Regulatory compliance, quality of medical care, streamlined process, and end user experience were prioritized during the design.

Implementation

The first and second phases of the project involved getting relevant employee information loaded into Epic from the UCPATH, our human resources system, and appropriately identifying their medical records as such. This would allow for appropriate reporting and billing for employment-related services as well as creating a firewall to protect employee privacy. Around Fall of 2020, an influenza vaccine mandate from the University of California Office of President accelerated the need to set up Epic for mass vaccination of employees, which would also help prepare the organization for imminent COVID vaccination that was slated to come out later that year. MyChart, Epic’s secure patient portal, was enabled for all employees to allow for quick self-scheduling into mobile vaccination sites as well as the peer-to-peer vaccination program. The focus in this phase was to design the EHR so that only medical information pertinent to employment (eg, immunizations, allergies, relevant labs) is visible in the employee health context, while hiding all

other personal medical information such as patient problem list, medications or medical history, and encounters.

Once the structural foundation for COEM in Epic had been created and tested during employee vaccinations, the third phase moved on to completely transitioning new employee onboarding and employee health services for internal UCSD employees. June 2021 was the first time Epic was used for a full end-to-end workflow from scheduling to billing, in the employee health departments. This phase included the transition of most intake forms and questionnaires into electronic format to allow for a streamlined onboarding experience.

Finally, in December of 2021, workers’ compensation and commercial clients’ occupational medicine workflows were moved to Epic, hence completely transitioning off legacy systems. The focus in this phase was on electronic completion and filing of regulated forms, establishing reports and gateways to share pertinent information with employers, and setting up workflows to ensure accurate billing for workers’ compensation and corporate accounts.

Optimization efforts have continued since the official close of the project in the Spring of 2022, including US Pharmacopeial Convention 800 surveillance and other questionnaires, hospital exposures workflows, expansion of telemedicine, and reports.

Data Assets and Data Infrastructure

Our COEM was implemented as a unique department enabling us to segregate our user roles, views, and permissions in the EHR. In addition, COEM-specific EHR registries and datamarts were created:

Project Timeline

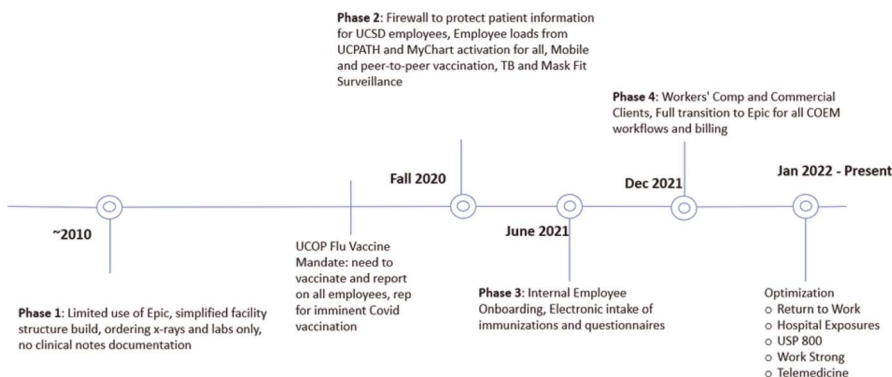


FIGURE 3. Project timeline, starting with initial use of Epic by the University of California San Diego Health system.

employee (49,994 active, 11/2022), health (27,161 active, 11/2022), and tuberculosis risk registry (2,356 active). Not only did these support population management, they were also created to specifically aid in the architectural redundancy for privacy as well as downstream data assets. This infrastructure also enabled COEM to apply specific rules and decision support that leveraged COEM requirements and be context specific as well. The registry also enables use of enterprise integrated tools and infrastructure such as the self-service query tool Epic SlicerDicer as well as business intelligence.

Postimplementation Satisfaction Survey

A satisfaction survey was performed from February 17, 2023, to March 15, 2023, adapted from recommended postimplementation surveys performed by Epic (Table 1). There was an 83.3% responder rate.

RESULTS

Since the transition to Epic through October 2022, there were a total of 14,513 encounters. Employee health visits accounted for 41.9% ($n = 6079$) and were entirely in-person, while worker's compensation visits accounted for the remaining 58.1% ($n = 8434$) of which 20.4% ($n = 1719$) were telehealth. In the 3 months immediately after implementation, 25% of visits were video visits. In the last 3 months, 19.3% of visits were video visits, likely because of decreased COVID burden. Overall, the majority of visits were for employee health (41.9%, $n = 6079$), followed by surveillance and immunization (32.7%, $n = 4739$; telehealth 5.8%, $n = 276$), worker's comp follow-up (18.7%, $n = 2721$; tele 49.7%, $n = 1352$), and initial visits (6.7%, $n = 974$; tele 9.3%, $n = 91$).

Questionnaires

Before transitioning to Epic, all questionnaires were paper based. Since the transition, approximately 15 questionnaires have been built in Epic and are now distributed electronically. This includes questionnaires for pre-employment (eg, fit testing, respirator questionnaires, preplacement, etc), surveillance (eg, animal allergy, biosafety lab, hazardous materials), and postinjury (eg, initial injury intake and follow-up). To date, 5358 questionnaires were completed electronically.

Patient Portal/MyChart Activation

Use of the secure patient portal has become a primary way of communicating and reaching out to patients. Currently, 46,468 (92.9%) of 49,994 OH patients have activated their MyChart Patient Portal. Of the remainder, 52 patients are in an inactivated status, 21 patients declined, 338 are pending activation, and 3115 do not fit into any of these categories.

Needlestick Injuries

Needlestick injury visits were identified as a possible area where telehealth visits could be preferred to improve acute timely access. Overall, 58.6% of needlestick injuries today are seen as video visits. Needlestick injuries accounted for 63.7% of new telehealth encounters since Epic GoLive.

TABLE 1. Adapted Postimplementation Satisfaction Survey

| |
|--|
| Q1: Please select the closest description of how often you use Epic. |
| Q2: EPIC helps me be efficient in my day-to-day job. |
| Q3: The quality of patient care has improved with EPIC |
| Q4: Overall, I am satisfied with Epic. |
| Q5: Do you have any suggestions for changes in Epic that would improve efficiency and/or patient care? |

Mass Onboarding

Every year, approximately 400 new residents and fellows are onboarded at the UCSDH. In 2019, there were 330 house staff onboarded entirely through paper. Starting in 2020, there was a shift to a hybrid approach, with 391 staff onboarded in 2020, and 370 onboarded in 2021. In 2022, 376 new house staff were onboarded entirely using Epic.

Postimplementation Satisfaction Survey

Of the responders, 35.48% were providers, 19.35% medical assistants, nurses, 9.68% front office, 25.81% administrative, and 9.68% other. All users used Epic daily with the vast majority using it for more than an hour per day (96.88%). Most users thought Epic helped their workflow and efficiency (84%), while 3% thought that it was a detractor. Almost all users thought that the quality of patient care improved with Epic use (90%). Furthermore, Epic satisfaction was 87%. Areas that were identified for improving efficiency and/or patient care were continued questionnaire creation, improving immunization clinic, allowing for notifications if a case is denied, and allowing patients to message their COEM provider in MyChart.

DISCUSSION

This current report is to our knowledge the first description of integration of an OH department with end-to-end workflows into an academic health system EHR. Overall, the satisfaction with transitioning to Epic was high among all users. As described in the DeLone and McLean Information Systems Success Model, high-quality systems are associated with more use, increased user satisfaction, and positive net benefits.¹⁴ Herein, we discuss the benefits, challenges and limitations identified during the process of integration.

Benefits of EHR Integration

Activation of Telehealth Video Visits

Telehealth services grew exponentially throughout the pandemic due to social distancing guidelines.^{15–18} Before Epic integration, we had to use a third-party software solution, which resulted in concerns regarding scheduling, security, and lack of information technology support. Integration permitted easy visit scheduling, a secure platform and increased organizational support. Furthermore, more efficient, integrated telehealth services also assisted with COEM staffing shortages, similar to experiences of countless clinics during the pandemic.^{19,20}

In addition, implementing telehealth video visits for issues such as needlestick injuries held significant value to COEM's customers and the organization. Given the significant staffing shortages, using telehealth for needlesticks improved patient satisfaction and reduced the time that essential workers such as physicians, nurses, and environmental health workers spent outside of the clinical areas.

Digitization of Multiple Questionnaires and Medical Clearance Letters

Through a preimplementation LEAN workflow analysis, we determined that completion of paper forms such as OSHA questionnaires, medical questionnaires, post visit instructions and clearance letters significantly increased visit times, and back-office staff burden. The digitization of this paperwork offered numerous advantages, including the ability for patients to complete these before their visits via MyChart as well as decreasing the amount of time that back-office staff spent scanning documents.

Streamlined New Employee Onboarding

The ability to electronically preassign questionnaires, streamline documentation through templates and flowsheets, and provide a "one stop" location for all records and faster communication via patient portal, reducing visit times by 36.7%. In addition, as an academic

teaching healthcare institution, approximately 400 house staff are onboarded every year on 2 days in July and August, and the new process significantly improved end users using EHR communication portal to collect necessary onboarding information (vaccination records, completion of medical questionnaires).

Improved Reporting Capabilities

One of the largest challenges faced by the COEM was the lack of organizationally supported reporting capabilities and multiple legacy systems. Reports previously created through multiple applications such as MS Access (EpiNET), Excel, Systoc, and other legacy systems were consolidated into Epic. The use of an integrated EHR and organizational IT reporting capabilities allows the COEM to develop reports based on our business needs.

Epic integration with UC wide databases such as UCPATH (HR database) has allowed us to develop reports that can break down data in a granular fashion. For example, by breaking down vaccination data by employee labor union, or by ethnicity and race, we can identify health disparities and build targeted strategies to address these issues, which is key to improving quality of care and worker health.²¹

Improving Patient Engagement

Using legacy systems severely hampered meaningful patient engagement, one of the main goals of the Health Information Technology for Economic and Clinical Health Act.²² Before transition, communication was handled primarily via telephone calls. With Epic integration, patients are now engaged by providers and ancillary staff through numerous avenues. Through MyChart and Epic, automatic text message notifications can be set to remind patients of future appointments and specifics of their visit. Secure messaging and patient portal allow providers and ancillary staff to discuss various aspects of care with patients including answering questions, discussing lab results, and coordinating future care. In addition, patients can directly upload information such as titer results and vaccine records that may be pertinent to their visit with COEM. This allows for care information to flow bidirectionally between caregiver and patient and has helped streamline clinic visits as well as increase patient engagement with providers.

Furthermore, the 21st Century Cures Act provisions that patients should be able to easily access their health records electronically. Using Epic, occupational medicine patients are able to see provider notes that are pertinent to their care and easily share these with other specialists. Patients can access imaging and lab results that are done within UCSD and patients can engage their providers and ask questions through the patient portal. To our knowledge, no other occupational medicine-specific EMR allows this capability.

Challenges and Limitations

Institutional Buy-in

Before the COVID pandemic the value of occupational medicine was not widely known.²³ We believe that this is part of the challenge that

occupational medicine departments face in receiving institutional buy-in to place resources into developing and implementing integrated EHRs. With this in mind, it is necessary for organizations that are considering integrating EHRs to have institutional buy-in to properly allocate resources necessary to meet the complex EHR needs of an occupational medicine department. One of the key factors to our successful implementation was UCSD Health Senior leadership support that identified the value of a robust COVID pandemic response plan early on, including easy access for testing and vaccinations, intended workflows for exposure and return to work management, streamlined onboarding process, management of workers comp, and dashboard metrics for operational planning. Customization of EPIC for occupational medicine required significant investment due to the build complexities and in-depth expertise in occupational medicine and employee digital privacy.

Better “off the shelf” occupational medicine tools

Electronic health record systems such as Epic lack occupational medicine “off the shelf” tools or modules. We believe that to have continued success in EHR integration, software developers need to develop better off the shelf occupational medicine tools or modules. We hope that as more institutions decide to integrate their EHRs, there will be a call for further research and development of occupational medicine tools and modules that meet the unique and complex needs of occupational medicine practices. We believe that as more “off the shelf” tools become available, more organizations will be able to transition quickly and seamlessly.

Operational Streamlining

One significant challenge that organizations will face is how to streamline operationally with the integration of EHR systems. It is important to remember that transitioning systems requires a lengthy period of trial and error and that organizations should be able to support operational streamlining not just during the integration phase but also postintegration. Occupational medicine practices must be able to understand what existing operational challenges they face as well as what future challenges they will encounter both at practice and organizational levels. Identifying these challenges and allowing for a period of streamlining is essential to the successful EHR integration of an occupational medicine system.

CONCLUSIONS

Integrating occupational medicine clinics into an academic health system’s EHR system undoubtedly offers many benefits, despite build challenges due to lack of off shelf Epic occupational medicine module. We hope that other occupational medicine clinics that are a part of large academic health systems are inspired to integrate into their system wide EHR. In addition, we hope that through awareness, there will be a larger push for EHR systems to provide built-in firewall capabilities that further mature privacy.

TABLE 2. CDC’s Five Pillars of Health Outcomes and How They Are Addressed in Each Portion of Occupational Medicine Electronic Health Record Integration^{29,30}

| CDC 5 Pillars of Health Outcomes | Occupational Medicine EHR Integration |
|---|---|
| Engaging patients | <ul style="list-style-type: none"> • Easy access to immunization and lab work done through employee health • Electronic questionnaires |
| Improving care coordination Improve public health. | <ul style="list-style-type: none"> • Access to worker comp notes • Easy access to employer sponsored vaccination and testing (COVID-19, flu) • Comprehensive vaccination programs (peer to peer, drive thru) |
| Ensure privacy for PHI | <ul style="list-style-type: none"> • Streamlined exposure medical management • EHR HIPAA compliance robust infrastructure |
| Improving quality, safety, and efficiency while reducing health disparities | <ul style="list-style-type: none"> • Additional privacy for employee related exams • Medication safety |

Furthermore, implementing an interoperable OH EHR must consider lessons learned during the COVID-19 pandemic and unique reporting of OH providers to employers, insurers, public health authorities, and regulatory bodies such as OSHA. A hospital's OH department must be able to perform symptom screening, testing, contact tracing, quarantine tracking, vaccination compliance tracking, and return to work determination.^{24–26} The major constraints in appropriate disease surveillance, as recognized by the National Academy of Medicine, was the lack of data sharing abilities with hospital EHRs.²⁷ The COVID-19 pandemic highlighted the critical need for OH clinics to offer robust EHR function, interoperability and reporting services that required close partnership with other health system departments and external agencies. The pandemic also highlighted the importance of telehealth infrastructure within an EHR.²⁸

Electronic health record integration in occupational medicine facilitates improvement of worker healthcare through meaningful use tools to achieve the Centers for Disease Control and Prevention's five pillars supporting improved health outcomes, quality, safety, and efficiency while reducing health disparities (Table 2).^{29,30}

In conclusion, integration and interoperability are now fundamental building blocks to any OH EHR solution, supporting longitudinal worker population trends, and enabling population level targeted interventions to improve worker health status.

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