Implementation of an Electronic Health Record in the New York City Jail System

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Introduction

In New York City, the administration of health care provided within the jail system is markedly different from that in other jurisdictions across the country. By virtue of the city charter, the Department of Health and Mental Health (DOHMH) manages all aspects of health care within the jail system, while the Department of Correction (DOC) supervises the rest of the jail system. This means that the same government agency that oversees health and health care for the community at large also oversees health and health care for the jail-involved population. The jail population is considered part of—not separate from—the general population, and the health of both is seen as linked.

Jails generally are not regarded as part of the local health care safety net, but the opposite holds true in New York City, as reflected by the inclusion of the jail system in the Primary Care Information Project (PCIP) administered by the DOHMH's Division of Health Care Access and Improvement, which includes the DOHMH's Community Electronic Health Record Bureau. Launched in 2005, the PCIP aims to improve population health in disadvantaged communities through health information technology. Specifically, the program supports the adoption and use of electronic health record (EHR) systems among primary care providers in New York City's underserved communities.

The New York City jail system is the nation's second largest and receives 90,000 admissions each year for approximately 60,000 unique individuals. The system comprises 12 jails, nine of which are located on Rikers Island, with three borough houses in the Bronx, Brooklyn, and Manhattan. The clinics at all these jails have round-the-clock medical staffing, although only seven conduct intake.

In 2008, the jail system began implementing an EHR system called eClinicalWorks (eCW), essentially an outpatient EHR adapted for correctional health. Prior to that, the jail system used a health information system called the Rikers Island Information System (RIIS), which was developed by the city's contracted correctional health care provider, PHS Correctional Healthcare, Inc.[1]

RIIS had a one-way interface with the DOC's Inmate Information System (IIS), which allowed RIIS to be populated with inmate demographic data, including identification information. RIIS automated the documentation of the medical intake process, as well as orders and appointment dates that followed from the intake encounter. Follow-up medical encounters continued to be documented on paper.

Although RIIS had several advantages, it was not an EHR, and the continued production of parallel paper and computer-based medical records was a constant source of confusion for providers. For example, RIIS included a list for clinical problems that providers would enter electronically and then print out for the paper medical chart. Frequently, however, those charts were found to include multiple printouts of problem lists that had been updated, sometimes with handwritten notes.

DOHMH made the decision to replace RIIS with a comprehensive EHR. An executive committee from the DOHMH Bureau of Correctional Health Services (CHS)

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1 PHS subsequently used the RIIS platform as the base for developing the 1.0 version of a health information system called Catalyst, a nurse- centric, correctional-specific system with clinical decision support functionality. Catalyst was never deployed in New York City. After PHS merged with another company in June 2011 to form Corizon Health, Inc., further development for Catalyst was stopped. Corizon has since adopted eCW and is incorporating some of Catalyst's features into eCW.

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and PHS was formed in 2005 to plan the implementation of an EHR system in the New York City jail system. A request for proposals was issued in 2006. Core requirements included the ability to document all medical and mental health patient encounters and discharge planning services; order medications, labs, vaccinations, radiology, procedures, and referrals; allow multiple users simultaneous access to view and update a patient's chart (e.g., a physician seeing the patient and a lab reviewer in another location on Rikers); interface with the jail management system and laboratory and radiology vendors; and do quality assurance, service provision and compliance reporting. Among the non-core requirements was a preference for connectivity to other EHRs.

The city awarded the contract to eCW. That program, a practice model application, was and continues to be enhanced to function in a correctional health setting. Staff from eCW conducted site visits at the jails, met with key stakeholders, reviewed schematics of jail intake workflows to determine how best to optimize the application for correctional use, and trained users.

Background Information

In New York City, the path from arrest to a jail housing area can be a long one. Persons may spend up to 24 hours in the custody of the police before arraignment before a judge, where the decision to remand to custody is made. At that point, the person is transferred to the custody of the DOC and another 24 hours or more may pass during the jail intake process. The medical admission is the last step of that process. Unlike most jail systems, New York City's medical admission process takes approximately four hours to perform a medical history and physical examination that includes a rigorous health evaluation by a physician or physician's assistant; an offer of vaccines and laboratory testing; a universal offer of HIV testing; and referral to all types of needed care, such as mental health, chronic medical, specialty, dental, etc.

Once housed, patients have the opportunity to request sick call for new or acute medical complaints, as well as to access clinics for routine follow-up care. In addition to clinic-based medical care, specialty clinics located on Rikers Island deliver cardiology, neurology and nephrology/dialysis and several other types of specialty care. Other specialty clinic services are provided at Bellevue Hospital and Elmhurst Hospital.

Rikers also maintains 24/7 coverage by emergency medicine physicians, who triage hospital runs for medical emergencies. For patients too ill for general population housing but who do not require hospitalization, there are male and female infirmaries on Rikers Island with capacity for 100 and 30 patients, respectively. Finally, there are special housing areas for persons with severe mental illness, as well as for persons locked in segregation by the DOC. These housing areas also require access to some medical services and to the jail clinics.

Comparable to a medium-sized hospital, the New York City jail system annually delivers nearly 750,000 medical and mental health visits resulting in over 600,000 prescriptions. Almost 1,500 employees are dedicated to this mission.

DOHMH staffed a six-person EHR development team to work with eCW to identify correctional health functionality required to pilot the system; identify and resolve operational workflow issues; test the system; and assist with the primary data migration.

The decision was made to host the EHR system on the jail network. A number of factors were evaluated to select the system hardware, including: number of users; average daily jail census; projected number of inmates over five years; annual number of medical visits conducted for intake, chronic care, sick call, dental and specialty care; annual number of mental health intake and care visits; and number of projected external system interfaces. Because each member of the clinical care team would need a computer, additional challenges included upgrading the jail network infrastructure, installing network drops, and establishing a 24/7 help desk. DOHMH purchased the original hardware in 2007 and refreshed it in 2011. After the system pilot, a decision was made to manage all system implementation activities internally, including training, so an additional four-person implementation team was hired.

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Both major and minor modifications have been made to the EHR over the years, with revisions and upgrades that continue today. Fundamental challenges included training staff to use the EHR, matching or changing workflows to accommodate the EHR, and strengthening and adjusting quality assurance processes. Significant improvements from implementation of eCW have included better access to patient data from prior incarcerations, unification of medical and mental health records, and enhanced capacity for monitoring population health.

Implementation

In August 2007, DOHMH decided to pilot the EHR system at the sole female facility, Rose M Singer Center (RMSC), since it is a self-contained operation that involves limited inmate movement between facilities. Prior to the pilot, eCW built correctional health functionality into the system. The system went live in November 2008 and the pilot lasted six weeks. After a successful pilot, the implementation paused in order to staff the new implementation team, which then conducted a thorough operational analysis of the male facilities and their clinics; created training manuals and materials based on user roles; and developed operational/system workflows for each step in the process. Working in parallel, the EHR development team continued to identify requirements to enhance the product's correctional health functionality; these were then programmed by eCW. This included the transfer logic to follow male inmates as they pass from one facility to another and the creation of the "clinical console," a screen that provides access to in-person encounters.

Implementation at the 10 male facilities took place one at a time starting in April 2010 with the intake facilities and ending in April 2011. The intake facilities process inmates directly from the courts, requiring a medical intake examination, in addition to housing transfers from other facilities. Other key criteria in assessing facility readiness included infrastructure readiness, network connectivity, and the size of the inmate population. Just-in-time classroom trainings for all facility staff were held over the two to three weeks prior to go-live, and

practice domains were set up for staff use. Adequate time was allocated in the deployment schedule for the stakeholders to discuss necessary workflow changes and disseminate information.

Implementation included on-site 24/7 support from the DOHMH implementation team for three weeks. By the end of the second week, most operations had almost returned to pre-go-live productivity levels. By the fourth go-live in the schedule, the EHR implementation and development teams had settled into an established, well-rehearsed deployment procedure with set documentations. There are several facilities with unique medical care setting aspects. For example, the first male facility to go live, the Anna M Kross Center (AMKC) is not only the largest jail but includes several hundred patients housed in a mental health treatment center, with clinical staff providing inpatient mental health care in clinic settings as well as in housing areas. The mental health center at AMKC also includes an emergency center for patients in extreme mental health exacerbation, either awaiting or returning from transfer to hospital care.

A number of resource issues, exclusive to each facility and to each stage in the deployment schedule, presented special implementation challenges. The size and complexity of the AMKC go-live operation required a much larger support staff than was available on the EHR implementation team. Additional staff were recruited from DOHMH, trained in the application, and trained in providing support and in seeking further technical assistance for situations beyond their knowledge or experience. This support group was also available, in a more limited fashion, for later implementations. Implementation schedules for the Manhattan and Bronx jails overlapped, straining personnel resources. The shorter implementation schedule for the remaining facility implementations required calling upon the additional DOHMH support group as well as PHS "super users" as support staff.

Two of the last facilities to engage with the EHR system were the communicable disease unit (CDU) and North Infirmary Command (NIC). The CDU was built during

the tuberculosis epidemic of the 1990s and contains eight large structures called sprungs, which house negative pressure cells as well as a dialysis center, radiology, medical specialties and the Rikers Island emergency center. Common reasons for being housed in the CDU include rule-out for tuberculosis and isolation for varicella (chicken pox) infection. The NIC houses 100 extremely sick male patients with diagnoses ranging from orthopedic trauma to end-stage liver and kidney disease to terminal cancers. The NIC also includes two other dorms for patients who require disability accommodation or who have HIV-specific concerns. The work of these two facilities differs markedly from standard ambulatory care for which eCW was originally designed, and adoption at these two sites, particularly the infirmary, was extremely challenging.

Clinical Staff Responses

The first responses of the clinical staff were quite mixed. Staff welcomed the ability to readily see medical information from prior incarcerations, given the high rates of recidivism among patients. The legacy system (RIIS), which had functioned as a computer-based lab and medication order program, had saved information from prior incarcerations, but in a relatively inaccessible format. Medical staff also responded favorably to the ability to read all documentation and to assign patients to providers, especially during busy periods of intake or sick call; this made for a clearer delineation of duties for medical and nursing staff. Before the eCW rollout, paper charts were placed in baskets to await a provider's attention. Although patients were signed into clinics in a DOC log book, the clinic staff had no way of knowing when a nurse placed a chart into the basket or when it was retrieved. A major improvement, reported by both medical and mental health staff, was the elimination of a separate mental health chart. This allowed both sets of staff to see each other's work and care for a given patient.

Medical staff also reported several challenges. RIIS took a stepwise approach to intake, with "hard stops" that required the user to enter data in all the fields on a page before being permitted to proceed to the next page.

Although these hard stops did not ensure that all aspects of the intake history and physical were addressed appropriately, they lowered the likelihood that clinical staff would bypass steps in the process. However, the new system had relatively few hard stops, allowing providers to open a structured template and complete all, some, or none of the fields required by policy.

In addition, providers reported a significant slowing in their productivity with eCW. For example, providers who previously conducted eight to 12 intakes on medically ill patients during a shift were now doing only five to nine. The bulk of this additional time was spent clicking through fields in the history and physical exam sections and printing individual orders and prescriptions at the end of the intake process. Providers also quickly reported that the active medication lists were inaccurate and that the size of the problem lists was unmanageable.

The eCW implementation revealed several issues with medical care that were unrelated to the health record system itself. In the male infirmary, review of admission and daily nursing and medical notes (now listed in the same queue with eCW) found that medical and nursing staff were not communicating with each other sufficiently. For example, on admission to the infirmary, a patient might have a relatively prompt encounter with a nurse, but could wait eight to 16 hours to be seen by a physician or physician's assistant. Given the high acuity of many infirmary patients who were either returning from inpatient hospitalization or being removed from the general population because of poorly controlled health problems, remediating this slow response time was important.

The consensus of most providers within the jail system now is that, despite introducing some new opportunities for errors in patient care, the implementation of eCW represents a net improvement. The one aspect of care that has become more laborious with eCW is intake. Because of the lack of hard stops and the opportunity to click and document a variety of items that are unlikely to actually occur (e.g., the proliferation of fundoscopic exams that suddenly were being documented with eCW), new concerns with both documentation and productivity arose. To address this problem, the DOHMH has made

changes in how we conduct intake (e.g., consolidating or eliminating some questions), how we record information during intake (e.g., introducing smart forms with structured data fields to the history section), and how we audit the intake process and do quality assurance (e.g., modifying performance indicators to reflect limitations that are products of the system, not providers).

Discussion

General ambulatory care in the jail system has clearly benefited from the introduction of the EHR in the standardization of physical exams, inclusion of vital signs, and the improvement in documentation of assessments and plans. One important decision remains as to whether to use templates or smart forms that permit a structured set of questions (e.g., for asthma exacerbation or for hypertensive urgency) to be merged into an encounter. Individual providers have been trained to use many of these tools for their own disciplines, including mental health, primary care, emergency response, discharge planning, etc. Theoretically, these tools can strengthen efforts to standardize care and they allow for uniform reporting; however, like many technological solutions with great promise, they offer little benefit when not used. In the settings where we most actively educate, train, and reinforce providers on the use of these tools, we can achieve use of greater than 80%, but in other settings, these tools often go unused.

One area where eCW has greatly improved both care and documentation is injury reporting. The jail system sees approximately 1,000 patients each month for injury visits. Previously, these patients arrived with a paper injury reporting form from DOC, and providers wrote a brief assessment on the injury form and then a very brief note in the paper chart. With a dedicated visit type, providers now can identify when a patient was seen previously for an injury and link medications, referrals, and diagnostic imaging to the injury visit. From a population health standpoint, eCW has created an injury template that allows for collection of injury surveillance data, as recommended by the Centers for Disease Control, to include intentionality, location, mechanism, and disposition. Reports regarding changes or trends in any of these data points can be shared with the DOC.

Some functions still remain outside the EHR. More than 30 databases, reports, and spreadsheets continue to be generated on a daily basis (in addition to the reports that are produced by eCW). For example, emergency medicine providers keep a log of all patients they see, the nature of the complaint/encounter, and the disposition of the case. This log is computer-based and a daily report is generated to allow for review of emergencies, hospital runs, etc. These same providers also document individual patient encounters in eCW, but we have not yet been able to merge both sets of data into eCW. Mental health staff keep records of all self-harm gestures, including suicide attempts. This database resides outside eCW, but every suicide attempt or self-harm gesture is also documented in eCW. Integration of these and other similar databases into eCW represents a second frontier of post-implementation work.

In addition to these data set issues, there are the previously mentioned sources of data that feed into eCW with intermittent disruptions. For example, eCW relies on its interface with the jail management system, IIS, for patient demographics and facility and housing location information. Although successful interfaces with eCW's diagnostic testing and imaging vendors, BioReference, Quest Diagnostics, and Synapse, have been established, an interface between the Rikers Island pharmacy system and eCW has yet to be achieved. However, this link is scheduled to occur by the end of 2012. Specialty programs that provide linkages for patients outside of incarceration, such as Transitional Health Care Coordination, MedSpan (HIV services), and *A Road Not Taken* (substance abuse treatment program), have only partially utilized eCW, although templates are being created and customized for increased program use.

Other areas that are in the early stages of development or adoption include:

- Building an interface with our in-house pharmacy system to accommodate e-prescribing. This is a priority.

- Using tablet computers and wireless technology to document service provided to patients in medical isolation, mental observation, and segregated housing.
- Designing an "infirmary console" for use in the male and female infirmaries.
- Using clinical decision support alerts to assist providers with focused and comprehensive medical care.
- Hosting telemedicine between patients and providers located at other on-island and off-island facilities.

In addition, EHR implementation has positioned DOHMH to participate in the emerging State-wide Health Information Network for New York (SHIN-NY), which will link all of the state's Regional Health Information Organizations (RHIOs). In 2012, eCW plans to establish a connection with the SHIN-NY that will permit providers to view clinical information on inmates serviced by community organizations that are part of a RHIO. In this way, providers can deliver care that is better informed and therefore more effective and efficient. Upon discharge, the data on care received during incarceration would be made available through the RHIO to the community organizations. This health information exchange (HIE) would also allow DOHMH discharge planners to more effectively link inmates back to their community providers—a critical aspect of patient-centered care. An HIE supports continuity of care, but only when adopted widely within the community. DOHMH will also use the eCW patient portal to make clinical data available directly to patients after discharge.

Despite the numerous challenges of designing, implementing, and improving an EHR, medical care within the New York City jail system has clearly benefited from this endeavor. Patients are seen with the benefit of data from prior encounters and admissions and providers are better able to view the full spectrum of care that a patient is receiving. Our immediate goals are to solidify the skills of the clinical staff in using eCW, to procure and implement an integrated pharmacy system, and to begin information exchange with outside entities.