

Technical Note

University of Pittsburgh Medical Center Remains Tracker: A novel application for tracking decedents and improving the autopsy workflow

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Abstract

All hospitals deal with patient deaths. Multiple departments and personnel must be coordinated to ensure that decedents are safely managed. Prior to 2004, at the University of Pittsburgh Medical Center (UPMC), when a patient passed away, the process of alerting involved personnel, transporting the decedent, and tracking the completion of clinical documents was cumbersome and inefficient. In order to address these concerns, UPMC Remains Tracker, a web-based application, was developed to improve the efficiency and simplify the logistics related to the management of patient deaths. The UPMC Information Services division developed UPMC Remains Tracker, an application that tracks decedents' locations, documentation status, and autopsy status within UPMC hospitals. We assessed qualitative improvement in decedent remains tracking, decedent paperwork management, and staff satisfaction and compliance. UPMC Remains Tracker improved the process of tracking decedents' locations, identifying involved personnel, monitoring autopsy requests, and determining the availability for funeral home transportation. Resident satisfaction with UPMC Remains Tracker was generally positive and scored as "Improved efficiency" and makes identifying and tracking decedents "Much easier". Additionally, the nursing staff reacted favorably to the application. A retrospective review of the use of the application in the management of 100 decedents demonstrated a 93% compliance rate. Among the cases requiring an autopsy, there was a 90% compliance rate. The process of tracking decedents, their paperwork, involved staff, and decedent autopsy status is often inefficient. This assessment suggests that incorporating new technologies such as UPMC Remains Tracker into the management of hospital deaths provides accurate tracking of remains, streamlines the administrative tasks associated with deaths, and increases nursing and resident satisfaction and compliance.

Key words: Remains Tracker, decedents, autopsy, tracking

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INTRODUCTION

The University of Pittsburgh Medical Center (UPMC)

operates 20 hospitals throughout Western Pennsylvania. When a patient passes away, the decedent requires extensive paperwork, transportation, and, occasionally,

an autopsy. These tasks require significant coordination among the hospital staff. The Pathology Department is often involved in managing these cases, including performing all medical autopsies that come from outside institutions. Beyond managing the paperwork, the staff deals with multiple departments (medical records, security, and nursing staff) within multiple hospitals; this further complicates tracking.

Within UPMC, many other areas of pathology have improved their efficiency by utilizing tools such as the Lean Process and technological advances.^[1,2] For example, surgical pathology cases are routinely tracked as to their status in the workflow, including stages of grossing, histology processing, and the ordering of special studies. Prior to 2004, the autopsy service lacked any digital applications to manage deaths and the subset of decedents requiring autopsies. Historically, the paperwork and coordination of transport was telephone- and paper-based. When the morgue received a decedent, notifying and mobilizing the appropriate residents, staff, and personnel delayed autopsies. Clarifying autopsy authorizations and limitations required additional time, and identifying the clinical staff involved in a case was cumbersome. We computerized and streamlined these processes in an effort to improve our efficiency, monitor documentation, prevent transportation and storage issues, and to assess the value of incorporating new technology into the administrative tasks associated with decedents and autopsies.

MATERIALS AND METHODS

UPMC Remains Tracker Development

The Information Services Department developed UPMC Remains Tracker to track decedents' location, documentation, and autopsy status, using the input from various departments including nursing, security, pathology, and medical records. Development required the expertise of a senior software architect/engineer, a senior analyst, and representative personnel from nursing, security, and pathology. UPMC Remains Tracker was developed as a web-based application written in ASP. Net (C sharp) with an Microsoft SQL Server 2008 database back end (Microsoft Corporation One Microsoft Way Redmond, WA 98052-63993). The database design is described in the entity relational diagram [Figure 1]. The website and database are housed on internal servers and each has a failover server in the event of a primary web or database server failure. UPMC Remains Tracker was integrated into our enterprise patient database system (ePatient). UPMC Remains Tracker allows a search of the enterprise patient database to assist with data entry and lookup of the enterprise master patient index (EMPI) for entry of multiple remains under a single patient that is used to link fetal remains (still births, IUPD and terminations) to a patient. Due to the frequent receipt of remains

from outside (non-UPMC) facilities, the system can also function independently of the ePatient system to allow manual entry of all information. The application is kept secure by limiting access through the hospital's intranet and virtual private network through the secure site when accessed off-site. Users are authenticated with their network user ID and password against active directory. All access to the system is managed through the Identity Management System (IMS). Individual users are required to create application specific passwords in addition to their intranet passwords. The role of each user is defined, limiting access to parts of the applications based on roles. UPMC Remains Tracker is not linked to the laboratory information system and is used solely for tracking the status of a decedent, not for entry of autopsy findings or pathologic diagnoses.

UPMC Remains Tracker Deployment

Nursing, security, and pathology personnel required training to facilitate the deployment of UPMC Remains Tracker. Nurses, security staff, and transport personnel were trained differently depending on the facility. Many were trained via a super user/train the trainer approach. Some facilities offered a half an hour training session to review the application. Other facilities distributed a Microsoft PowerPoint presentation with a required competency test. Pathology personnel were trained via a Microsoft PowerPoint presentation with a required competency test.

The application was initially deployed at UPMC Magee Women's Hospital from 2004 to 2009. It was later deployed to the two hospitals with the highest average census and largest autopsy volume. Subsequently, smaller regional hospitals deployed the application once the larger institutions were using the application successfully.

Compliance was assessed by retrospectively analyzing the application's audit trail. The most recent 100 decedents overall and 100 decedents requiring autopsies were evaluated. Cases were flagged if the time between death and nursing completing their module was greater than 5 hours or the time of nursing module completion was within 15 minutes of the time of the release of remains from the morgue. The audit trail of these cases was analyzed to assess the likelihood that the nursing unit had released a body to transport staff without completing the nursing module and needed to be contacted to do so.

Pathology staff satisfaction was assessed using an electronic survey. Nursing satisfaction was assessed by casual conversations with staff and supervisors.

RESULTS

UPMC Remains Tracker provided real-time access for all involved parties in managing patient deaths and autopsies. Ultimately, five hospitals deployed the application. Figure 2

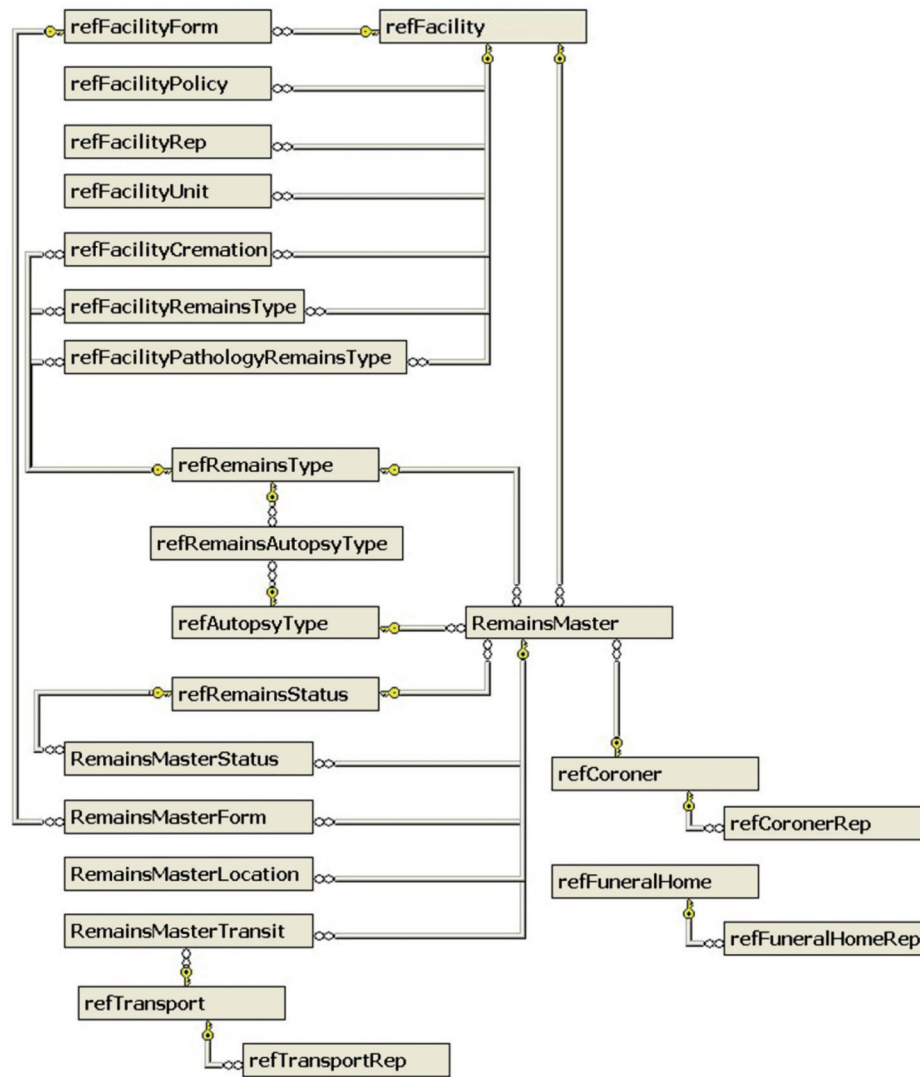


Figure 1: Entity relationship diagram.The diagram demonstrates the relationships and dependencies within the application database design of the core entities. The design provides for workflow flexibility at multiple facilities through switches and facility-specific setup, sharing of common entities such as coroner offices and funeral homes, and a consolidated repository of remains data for the organization while tracking the movement of remains within a facility, throughout the organization and their final release to an outside entity

shows the UPMC Remains Tracker workflow. Patients who pass away in participating hospitals were entered into the system and tracked from their location. Nursing staff enter information related to paperwork completion, patient identifiers, times of completion, and individuals or organizations who have been contacted related to processing the death [Video 1]. During the process of decedent transport, the status is listed as “in transit”. Once the decedent is transported to the morgue, the entry is moved into the “Remains in Morgue” category and the status is updated to either “Release to Funeral Home Pending” or “Autopsy Pending” [Figure 3]. The autopsy team then enters additional information about the funeral home, autopsy start time, autopsy end time, whether the decedent is available for transport, and any additional comments. Decedents who arrive for an

autopsy from non-participating institutions are manually entered into the system upon receipt in the morgue.

The initial deployment of UPMC Remains Tracker facilitated the tracking of 1088 remains from 2004 to 2009 at Magee Women’s Hospital. From the implementation of the enterprise version in April 2009 to February 2011, 4293 decedents were tracked. Of the 4293 decedents, 701 received autopsies. Casual surveys of the nursing staff demonstrated a positive impression of UPMC Remains Tracker. A formal survey of pathology residents’ use of UPMC Remains Tracker was answered by 19 of 27 residents. Of these 19 residents, 9 did not use the old system and 10 used the old and the UPMC Remains Tracker systems. All of the residents rated UPMC Remains Tracker as at least “Better” than the previous system. In addition, all of the residents using

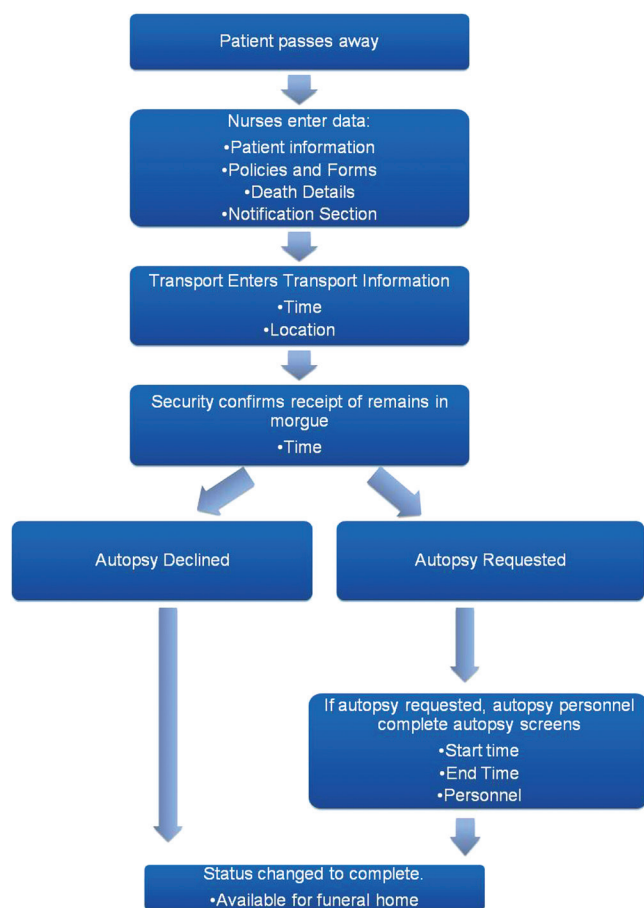


Figure 2: UPMC Remains Tracker workflow. The diagram depicts the workflow for UPMC Remains Tracker from the initial input of patient demographics by the nursing staff to the completed status of an autopsy. If an autopsy is not performed, these fields are not completed and the decedent is released to the funeral home. The ongoing tracking of a decedent's status allows staff to remotely investigate the location and availability of a decedent

UPMC Remains Tracker rated the application as “Useful” or “Very Useful”. No respondents felt the system was the “Same” or “Worse” than the previous system. All residents felt the application was easy to use. All of the residents who had experience with the previous system felt UPMC Remains Tracker improved their ability to identify pending cases. The primary complaint from residents was that some hospitals still lacked UPMC Remains Tracker.

The survey of the house staff identified 10 cases over a 1-year period in which decedents appeared in the morgue without documentation in UPMC Remains Tracker as “autopsy pending”. We did not have documentation of this rate in the previous system. In 7 of the 10 cases, the decedents were from institutions without UPMC Remains Tracker and were logged in upon arrival. Three of the 10 cases demonstrated non-compliance in proper UPMC Remains Tracker documentation. These cases of non-compliance were due to untrained transport

personnel neglecting to log the decedents and nursing staff failing to finalize their modules.

Evaluation of nursing compliance showed 93% compliance among the 100 most recent decedents and 90% compliance among the 100 most recent cases requiring autopsies. Among all the decedents, two cases demonstrated non-compliance with an excessive delay in completing the nursing component and less than 5 minutes between nursing completion and security releasing the remains. Five cases suggested non-compliance, evidenced by the nursing module being completed abnormally late. Among the 100 cases requiring autopsies, 3 demonstrated non-compliance with an excessive delay in completing the nursing component and less than 5 minutes between nursing completion and security releasing the remains. Seven cases suggested non-compliance with excessively late completion of the nursing module and chronological proximity to morgue receipt or commencement of the autopsy. The autopsy-related cases with compliance issues were divided between nine adult cases and eight fetal cases. Of the 17 autopsy-related cases, 7 demonstrated a longer than usual delay in completion of paperwork without other evidence of non-compliance. The presence of remains lacking documentation from institutions using Remains Tracker did not occur.

The return on investment was not quantified as the return was based on improved patient care and savings in time with improved correspondence and real-time knowledge of decedent statuses. Assessment of the nursing staff's perception and acceptance of the application and savings in time and effort was based on casual discussions. The nursing staff voiced satisfaction with a reduction in phone calls, emails, correspondence, and ability to prepare work schedules based on knowledge received from the system. They also felt the application was user-friendly and requested that UPMC Remains Tracker be implemented throughout the UPMC system. The comments suggest a positive perception of the application.

DISCUSSION

The use of UPMC Remains Tracker for tracking events surrounding the autopsy process resulted in consolidation of patient tracking and improved access to decedent information [Figure 4]. UPMC Remains Tracker improved the ability to ascertain which remains required an autopsy and which remains could be directly released to funeral directors.

By involving the nursing staff, security, and autopsy personnel, the application allowed immediate monitoring of the location and status of decedents. By allowing real-time access to the whereabouts and status of decedents, a wide range of staff gained confidence in accessing the

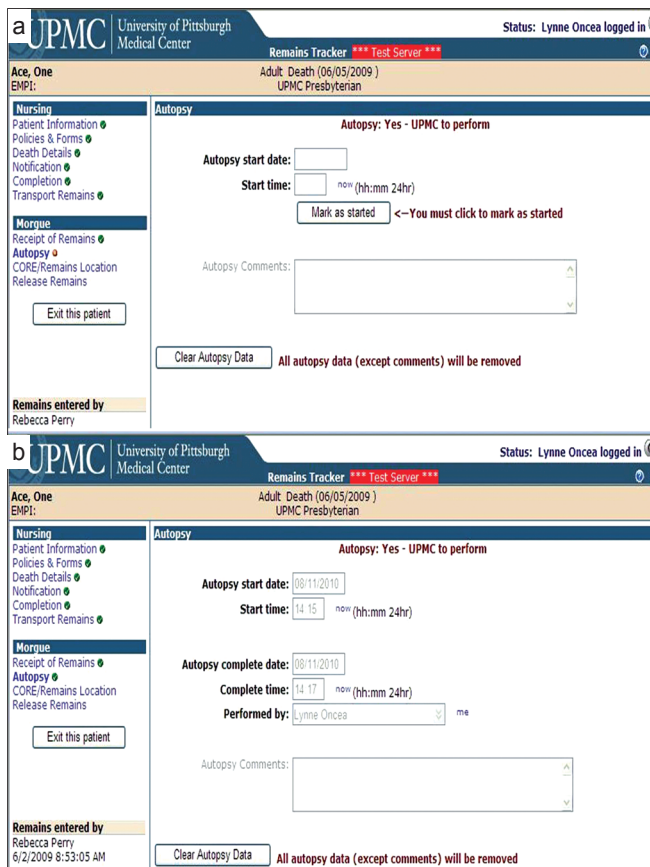


Figure 3: Screen captures of UPMC Remains Tracker autopsy module. The screen captures depict the modules within UPMC Remains Tracker where autopsy staff initially enter (a) and complete (b) relevant information relating to the commencement and completion of the autopsy

status of decedents and were able to schedule staffing. Pathology residents could quickly identify clinical staff and security involved in the cases to clarify information. In addition, the autopsy service uses a 2 p.m. cut-off for starting autopsies, and UPMC Remains Tracker provided useful documentation of the time of receipt of remains. These functions were perceived as marked improvements from the previous paper and telephone-based system. UPMC Remains Tracker also allowed the security personnel to monitor decedents' locations and mitigate security risks until the remains were released to funeral homes.

The implementation of any new clinical application is daunted by the challenge of user-acceptance and compliance. In this case, the pathology staff eagerly adopted the application. Security staff also required minimal encouragement and simply modified their routine. Security staff were pleased that the application allowed them to quickly document receipt of remains. Finally, the clinical staff was receptive to the application. Although a formal survey was not completed, casual discussions and requests for further implementation

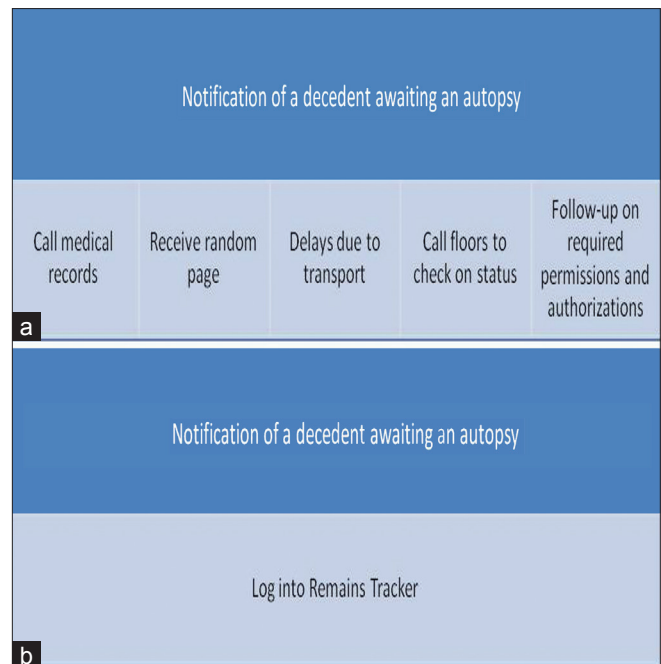


Figure 4: Original and updated workflow. (a) The initial workflow shows the cumbersome and inefficient previous approach to identifying cases requiring an autopsy. Cases required access to paper records, contacting multiple personnel via telephone, poor monitoring of possible autopsy candidates. (b) The new structure of identifying cases is encompassed and addresses by UPMC Remains Tracker, thus facilitating more efficient and convenient access to pending cases

support their satisfaction. The majority of nursing documentation is now performed electronically, and nursing reported entering data in UPMC Remains Tracker easier to navigate than the previous forms, the application easy to use, and the interface with the ePatient system useful.

Compliance monitoring is difficult. It was not performed proactively, however, the retrospective evaluation demonstrated a high degree of compliance. The 93% overall compliance rate is a testament to the usability and convenience of the application and the replacement of the previous method. Remains cannot be released from the hospital without completion of the modules. This ultimately guarantees compliance. The cases of non-compliance suggest that the clinical staff still have leeway in their timeliness of completing their modules. On busy units, the nursing staff may release the body to transport staff and then subsequently complete the paperwork as time allows. This creates an opportunity for decedents to arrive in the morgue without completion of the modules. It would be ideal to require that all paperwork be complete prior to the remains being transported. Unfortunately, nurses need flexibility to complete the paperwork as their responsibilities to the other patients may hamper the immediate completion of decedent paperwork. The non-

compliance events were inconsistent and not related to a single unit. They likely represent training issues or lapses due to time constraints on the nursing units. Fortunately, UPMC Remains Tracker allowed rapid identification of the involved staff and helped facilitate rapid completion of paperwork in these rare cases when a nursing unit must be contacted.

Tracking and managing decedents is an important and sensitive issue. The process is complicated by the large number of involved staff, types of paperwork, transient locations of decedents, and inconsistent autopsy requests. Implementing UPMC Remains Tracker improved these processes, and developing a central application for inputting decedent data led to useful gains in the tracking, management, and accuracy of the process. While other divisions, including cytopathology, have begun to extensively involve technology in their workflows,^[3] incorporating technology into issues surrounding the medical autopsy has been less

pronounced. UPMC Remains Tracker demonstrates that the process of identifying decedents and tracking them and their paperwork can benefit from computerization and improve efficiency surrounding managing decedents and the events surrounding autopsies as well as improve interdepartmental communication.

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