New Hampshire
*e*lectronic Cause Of Death (*e*COD)
Mobile Application

New Hampshire Department of State
Division of Vital Records Administration

Data Management, Analytics & Visualization Award
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Executive Summary

It should come as no surprise that public health officials are keenly interested in what causes people to die. Most deaths fall into a handful of categories nationwide with heart disease and cancer together accounting for almost half of all deaths. Other common diseases like diabetes and influenza make up much of the remainder.

Though these deaths are certainly tragic, they are also known quantities. There isn't a public health official in the U.S. who is unaware of cancer's role in American deaths. As such, there is tremendous attention paid to combatting such diseases.

But what about the lesser-known quanitities such as drug epidemics and suicide? These are causes of death that often require swift and effective action by local, state, and federal officials. In most states, those causes of death are reported manually. Hand-written records are sent via traditional mail or fax to relevant internal state departments and to the Centers for Disease Control and Prevention (CDC). The process can take weeks or even months, creating an unacceptable lag between the event of a death and the review of the data.

If we consider a virus such as Ebola where people in our communites may be dying from this terrible disease, knowing the CDC might not have that data for over a month would not be comforting, nor efficient. In today's digital age, utilizing New Hampshire's broad array of technological investments to our mortality ecosystems surpasses any CDC National Center for Health Statistics (NCHS) expected standard for mortality and demographic performance. Whereas the average number of days elapsed between receipt date and event date in April 2018 noted by the CDC/NCHS VSCP contract performance report was a lag of 35 days nationally, our death events were recorded in 2 days.

New Hampshire Department of State, Division of Vital Records Administration (NH-DVRA) recognized the need for physicians and medical professionals to report real-time, accurate information easily. NH-DVRA conceptualized a solution, a mobile application available to physicians and all certifying practitioners to pronounce and certify death events. This solution would allow physicians and other certifying practitioners to report causes of death to the New Hampshire Department of Health and Human Services and the CDC in near real-time. NH-DVRA proposed a proof-of-concept application to the CDC. NH-DVRA received a performance contract of $200,000 from the CDC to develop a first-of-its-kind mobile application to pronounce and certify death events in New Hampshire. The result was the New Hampshire *e*lectronic Cause of Death mobile application, or simply "*e*COD."

*e*COD simplifys death reporting. *e*COD is a mobile application that nurses, physicians, and other certifying practitioners can install on phones or tablets, whether iOS or Android compatible. By simplifying and standardizing cause-of-death record generation, *e*COD has brought vital records reporting into the 21st century. Public health officials at the state are able to access information as soon as it is filed within the *e*COD application. *e*COD utilizes Application Programming Interfaces (APIs). Built into *e*COD is an API affording instant access to a federal data dictionary/ validation tool (VIEWS2) for causes of death available to certifiers literally at their fingertips.

This access improves the quality of cause of death reporting. *e*COD ensures data management and analytic integrity on the local, state, and national level.

Arguably, New Hampshire has revolutionized the collection, management, and analytic power of perhaps the most important dataset of all: cause of death.
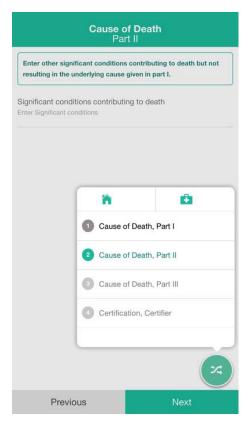
Concept

New Hampshire has long been at the forefront of automation in health information technology. New Hampshire's vital records automated systems has been registering vital (birth, death, marriage, etc.) events dating back to 1988. In 2016, in order to effectively serve the public and to help certifying practitioners certify deaths without the use of a desktop or laptop computer, New Hampshire determined the need for a mobile application. An application that would work online and offline, that would be user-friendly and embraced by its user's community. *e*COD was designed and implemented throughout the state.

Working within the CDC's parameters for the performance contract, the NH-DVRA drew up a concept and through collaboration with Maryland-based health IT contractor CNSI developed a first-in-the-nation, state-of-the-art, true mobile application. The application allows identified health workers to pronounce and certify deaths in the field with ease by updating the electronic death registration system (EDRS), New Hampshire's Vital Records Information Network (NHVRIN).

In seeking an IT vendor for the project, the NH-DVRA turned to a vendor with proven success, CNSI – a company widely known for its experience designing state Medicaid Management Information Systems (MMIS). In conjunction with its Michigan MMIS, CNSI had also recently rolled out an application that gives the state's Medicaid population access to health care information and resources. The application – known as myHealthButton – was an innovative piece of public health technology that proved instantly valuable. The success of the project demonstrated to the NH-DVRA that CNSI would be up to the task of developing yet another equally innovative application for New Hampshire.

New Hampshire together with CNSI developed and launched a truly mobile application that exceeded the concept. Starting in January of 2017, physicians and other certifying practitioners could register to have access to *e*COD. When a death occurs, the verified user can instantly report the cause of death and associated details. All data is securely encrypted while on the mobile device.

In the past, a cause of death report may have only listed "drug overdose," but in *e*COD, the user may provide more detail – the specific type of drug and volume, for instance. Armed with a deeper understanding of the death – or a string of deaths – policymakers can respond more effectively. For example, officials may recognize the spread of a new type of drug and relay that information to local law enforcement and health care workers.

NH-DVRA wanted more analytics still, and added a component to the death pronouncement and certification. NH-DVRA was inspired and developed an additional API naming it Situational Surveillance. Situational Surveillance is a set of questions which can be added by NH-DVRA to certification workflow. When added, these questions will be asked across platforms. Situational Surveillance questions are asked of *e*COD and NHVRIN users. These questions are defined for a specific timeframe, and are worded by NH-DVRA with input from New Hampshire public health officials and/or the CDC. These statistics are essential to data quality. Questions can be asked to monitor and pinpoint areas where concentrations of events are presumed to be occurring. Situational Surveillance can be used for reporting any type of event, such as viral outbreaks, pandemic situations, fetal alcohol syndrome (FAS), or neonatal abstinence syndrome (NAS). Anything needed for surveillance can be monitored for a timeframe and even provide geographic visualization of events. Situational Surveillance is available in the NH-DVRA systems for death and birth.

For example, if New Hampshire is concerned that opioid-related deaths are occurring within New Hampshire or a certain region of New Hampshire, *e*COD and NHVRIN can prompt certifying practitioners with specific questions about any pertinent information which contributed to the death. The real-time information sharing allows public officials to evolve the dataset and mature their understanding of the issue.

As NH-DVRA's biggest user of these gathered metrics, Lisa M. Morris, MSSW, Director, NH-Department of Health and Human Services, Bureau of Population Health and Community Services, wrote: *"DVRA successfully designed and implemented a Situational Surveillance feature for NHVRIN [sic] and eCOD. This feature has greatly improved our capacity to respond quickly to emerging public health issues by enabling next-day implementation of pop-up questions on the birth and death certificates. Situational Surveillance allows us to capture important new data temporarily without the need to go through a lengthy process to permanently add questions to these interfaces."*

*e*COD also promotes due diligence and compliance. *e*COD will always ask if a death may be categorized as due to an injury. The user is prompted to consult with the medical examiner, as an investigation may be necessary to determine whether the death was an accident, suicide, or homicide.
The application also provides resources to the user that can help make the correct reporting decision and reminder alerts indicating pending death records that have not been filed.

Mundane though it might seem, abbreviations and handwriting on paper documents can be significant obstacles to overcome when the process is done manually. Using the APIs built into the system, *e*COD improves accuracy. These APIs reveal immediate matches on characters for consistency and accuracy in term usage, through interfacing with the VIEWS2 API webservice data dictionary/validation tool provided by the CDC. There were more than 2.7 million deaths in the U.S. last year (New Hampshire accounting for over 12,000 of those). Even a small percentage of errors or misunderstood abbreviations could mean wrongly reported causes of deaths for tens of thousands.

Significance

The significance of *e*COD, in terms of accessibility of data to drive public health outcomes, cannot be overstated. As the first mobile application of its kind, *e*COD dramatically reduces time and effort while improving accuracy and timeliness of critically important health information.

*e*COD is vastly improving the collection, management, and analytic power of cause-of-death data. The ability for policymakers to react and even potentially prevent public health crises with this information will no doubt save lives.

Impact

As for physicians and other certifying practitioners, an immense amount of time and effort is saved by using *e*COD, compared to traditional pen and paper methods. In addition, *e*COD also improves the timeliness and accuracy of that data, which further expands the public health data base integrity. This type of immediate, actionable data benefits these individuals and improves their ability to protect and serve their communities.

The *e*COD architecture, utilizing the accepted industry standard in electronic health care records, HL7 JSON/FHIR protocol, provides *e*COD infinite interoperability and expandibility for certifying practitioners to access existing health records through data mining, further ensuring data quality.

The long-term future for *e*COD is expanding as New Hampshire continues developing *e*COD's interoperability. *e*COD will now include FHIR APIs to interface with HL/7 medical records, further enhancing the certifying practitioners abilities to report with ease, thereby increasing the accurate quality findings and determinations for causes of death. *e*COD has the potential to serve as the gold standard for building an API. The standardization of API Gateways provides the rich, stable interoperability today, and into the future of electronic health records and health informatics.

Conclusion

NH-DVRA initiatives have greatly enhanced the reporting tools used by public health officials at the local, state, and national level. *e*COD has untapped potential for New Hampshire's public health officials. New Hampshire's combined interlacing of the automated registration and data collection tools readily identifies and combats inaccuracies through effective data management using *e*COD's visualization interface along with Situational Surveillance analytics. *e*COD now moves New Hampshire into the future as NH-DVRA provides certifying practitioners an enhanced death certification process. New Hampshire public health officials are better equipped with accurate and timely data to respond to contemporary needs of the New Hampshire public.

This first-in-the-nation mobile electronic cause of death initiative, *e*COD, was conceptually designed, architected, and licensed by the New Hampshire Department of State, Division of Vital Records Administration, with technical collaboration and software development by our vendor CNSI, Inc. using funds contractually obtained from the CDC/NCHS specifically for this task.

Success of these technological initiatives to produce quality results is hard to ignore. Therefore it is no surprise that the CDC is promoting *e*COD as the de facto standard for adoption throughout the nation.