

The I-READI Quality and Safety Framework: Strong Communications Channels and Effective Practices to Rapidly Update and Implement Clinical Protocols During a Time of Crisis

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Summary

During a time of unprecedented patient volume and clinical uncertainty, a diverse team of health system administrators and clinicians within the University of Pennsylvania Health System quickly investigated, updated, and disseminated airway management protocols after several airway safety incidents occurred among COVID-19 patients who were mechanically ventilated. Based on this experience, the team created the I-READI framework as a guide for healthcare systems to prepare for and quickly respond to quality and safety crises.¹

The I-READI acronym outlines the steps (i.e., Integration, Root-Cause Analysis, Evidence Review, Adaptation, Dissemination, and Implementation) the team took in response to a higher-than-expected rate of endotracheal tube obstruction and reintubation among patients with COVID-19. The first step and the foundation of the I-READI framework is the *integration* of quality and safety bodies into vertical and horizontal communication pathways. The structures for this essential step should be in place before a crisis. For example, the innovation team reacted quickly by leveraging existing structures to expand and streamline communication channels, including through daily COVID-19 safety huddles that directly connected frontline providers with the health system's multidisciplinary Critical Care Committee leaders. After they were aware of the problem, team members conducted an *aggregate root-cause analysis* on the airway complications. They also reviewed available emerging *evidence*, which was at times anecdotal and evolving day to day, by consulting with colleagues and experts. After gathering information, considering occasionally disparate opinions, and drawing on multidisciplinary expertise, the team *adapted* their protocols for treating ventilated patients, including changing the risk categorization of patients with COVID-19, issuing stricter guidelines for monitoring for airway resistance, and increasing ventilator humidification.

Just over a week after the identification of the first safety incidents, the team *disseminated* the revised protocols using strengthened and expanded communications channels such as daily and ad hoc huddles, web-based teaching modules, standing conferences, and user-friendly one-page clinical guides. To support *implementation*, unit leaders provided just-in-time training, ICU dashboards facilitated a rapid scale-up of new patient safety checklist components, and offsite respiratory therapists oversaw revised ventilation procedures via remote video monitoring.

Within two weeks from the time that pulmonary and critical care clinicians sounded an alarm about the airway complications, rates of endotracheal tube obstruction and reintubation declined to pre-COVID-19 levels. The team attributed their success in quickly addressing the problem to the health system's ability to rapidly strengthen safety communications pathways, in addition to the hard work, multidisciplinary teamwork, and dedication of all those who contributed.

Contact the Innovator

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Problem Addressed

The COVID-19 pandemic resulted in a time of unprecedented patient volume, rapidly changing or uncertain clinical guidance, and a need for organizations to respond rapidly to patient safety issues. Healthcare organizations sought ways to expedite processes to update protocols that were traditionally revised in response to the introduction of clear new practice-changing evidence.² Additionally, organizations needed ways to rapidly disseminate and implement updated protocols.^{3,4}

Description of the Innovative Activity

The I-READI framework is based on the steps taken by a multidisciplinary team at the University of Pennsylvania to rapidly respond to a concerning number of incidents of both endotracheal tube obstruction and failed extubations among ventilated patients during the early days of the COVID-19 pandemic. The team responded and addressed these problems within weeks and created the I-READI framework as a guide for other health systems to follow during times of crisis. I-READI stands for Integration, Root-cause Analysis, Evidence, Adaptation, Dissemination, and Integration.

The foundation and starting point for the steps taken by the innovation team was vertical and horizontal *integration* of quality and safety teams. The innovation team addressed a safety crisis quickly by rapidly

elevating frontline clinicians' concerns and efficiently coordinating and disseminating collaborative solutions via existing lines of communication that were expanded and streamlined in anticipation of the first wave of COVID-19 cases. The communication channels crossed units, specialties, and facilities, and included frontline clinical staff and administrative staff. Thanks to this preparative integration, by the time of the first surge, University of Pennsylvania Health System administrators, the health system's Critical Care Committee, and the pulmonary and intensive care unit (ICU) teams were gathering at regular safety huddles, poised to identify and address new problems as they arose. These meetings enabled clinicians and administrators across hospitals to be immediately aware of concerning cases of endotracheal tube obstruction and reintubation among ventilated patients with COVID-19.

After frontline clinicians raised concerns about the events to safety leaders during the daily safety huddle, critical care staff and administrators began to analyze the problem using aggregate root-cause analysis, examining multiple cases with the same complication. Individual team members gathered and synthesized the latest research findings and consulted colleagues around the world for insight. In the case of endotracheal tube obstruction for ventilated patients, after collecting available information, the team discussed and determined solutions and then adapted their ventilation protocols accordingly. In this example, to improve detection, the team decided to increase the frequency and improve standardization of airway resistance monitoring. To prevent this complication, the organization augmented airway humidification by switching from passive heat and moisture exchangers, deployed initially because of their infection control properties, to active heated humidification systems. The team distributed new protocols through multiple channels, including a publicly accessible COVID-19 learning website, pulmonary and critical care division faculty meetings, fellow-led educational conferences, and weekly operations and clinical update meetings. New guidelines were operationalized through easy-to-follow one-page clinical guides and integration into patient safety checklists guided by ICU dashboard data monitoring.

Context of the Innovation

With the COVID-19 pandemic, clinical practices as well as best practices for patient and healthcare worker safety have been rapidly evolving. At the start of the pandemic, hospitals and systems faced the challenge of providing care for patients with less understood conditions in the context of a rapid influx of new information. Clinical protocols and practices were revised to prioritize infection control for healthcare workers. Systems had to adjust to a high volume of critically ill and highly contagious patients. Healthcare staff were frequently reassigned from their usual roles to help in high-volume and high-need units. Often, those on the frontlines were working outside of their specialty areas, and there was an increased need for training and quality assurance. In general, to provide high-quality care and ensure patient and healthcare worker safety, it was important to distribute information rapidly and effectively to those on the frontlines. It was critical that frontline staff could communicate concerns they were seeing with patients back to hospital leaders.

During the earlier weeks of the COVID-19 pandemic, frontline workers in the University of Pennsylvania Health System noted that in mechanically ventilated COVID-19 patients, there was a concerning trend in

the number of reported cases of both endotracheal tube obstruction and, after extubation, reintubations related to obstruction of the upper native airway. Endotracheal tube obstruction due to mucus and debris is typically rare. However, in the health system's facilities, 9.2% of intubated patients during a roughly two-week period had an obstructed endotracheal tube.¹ Such obstructions can cause complications and be life-threatening.^{5,6} Also a cause for concern during the same period, 36% of patients required reintubation within 48 hours of extubation, which is several times higher than the typical rate of 10% in that timeframe.¹ Of particular concern, mortality rates for patients requiring reintubation are high, at roughly 30% to 40%.⁷

Results

In the two weeks after implementation of the new protocols, the rate of endotracheal tube obstruction among mechanically ventilated patients with COVID-19 decreased from 9.2% to less than 1%.¹ During the same period, reintubation rates decreased from 36% to 9%.¹ The improved rates are in line with prepandemic rates and have been sustained.

Innovation Patient Safety Focus

The I-READI framework innovation provides a step-by-step guide for healthcare systems to prepare for and respond to healthcare safety events in unpredictable conditions. Specifically, the framework applies to situations in which clinical protocols must be quickly evaluated, revised, and disseminated.

Resources Used and Skills Needed

To implement the I-READI framework, healthcare systems require established multidisciplinary safety and quality teams that allow for vertical communication (i.e., from frontline workers to unit leaders and hospital administrators) and horizontal communication (i.e., bridging specialties and facilities across a healthcare system). The innovation team stressed the importance of having communications and reporting platforms in place such as real time patient monitoring dashboards and safety huddles.

The innovation also requires that team members have skills and experience with aggregate root-cause analysis to review multiple cases of common adverse events. Team members should be able to assess how other sites are approaching similar issues by accessing their external peer networks. Technical resources such as real-time data monitoring capabilities and conducting remote tele-consults are also helpful. However, the innovation team emphasizes that material resources are less important than the ability of staff to come together for a common cause, communicate directly and efficiently across hierarchy and discipline, and commit their time to finding solutions.

Funding Sources

No outside funding sources contributed to the creation or implementation of the innovation.

Getting Started with This Innovation

For the pre-implementation planning phase, according to the innovation team, focus should be on ensuring that units, facilities, and the health system have the foundational components that allow for quick implementation of the I-READI framework even under rapidly changing conditions. These components are as follows:

- Streamlined communication pathways for real-time horizontal and vertical updates that are bidirectional (i.e., to and from frontline clinicians) and within units, hospitals, and across the health system
- Daily efficient virtual safety huddles during times of crisis that include frontline providers and clinical and hospital leaders
- Data collection systems to monitor care delivery, quality, and safety metrics in real time
- Daily board rounds with review of real-time patient data and systematic patient safety checklists
- Ability to convene emergency meetings within hours of sentinel events
- Ability to reorganize and repurpose existing groups and committees
- Standardized, centrally located, and accessible policies and protocols
- Remote clinical support
- Safety staff and standing safety committees
- Dissemination channels online, via standing conferences, and through regular meetings
- A culture of trust, commitment, teamwork, and flexibility
- Processes for gathering and synthesizing multidisciplinary expert input and resolving differing opinions
- Contingency plans (e.g., if supplies run out)

Sustaining This Innovation

Sustainability requires ongoing maintenance of committees, protocols, and channels for reliable communication and dissemination of accurate and up-to-date recommendations, as described in the sections above. The innovation team notes that it is important that clinical leaders and administrators maintain direct channels of communication with frontline clinicians to be aware of real-time safety issues and to be able to respond to problems as they arise. The team stresses that implementing organizations require commitment and flexibility to initiate and sustain the innovation; organizations must be able to react to the changing needs of a situation by, for example, repurposing and reconfiguring existing committees. Finally, the team reports that convening key stakeholders when deliberating practice changes helps to support the sustainability of those changes.

Adoption Considerations Use by Others (Use By Other Organizations)

The innovation team published an article on the innovation in *the New England Journal of Medicine* in January 2021 and has since received several inquiries from interested organizations.

References/Related Articles

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Footnotes

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