First Databank

FDB ISSUE BRIEF:
Alert Fatigue

YOUR NURSING HOME PATIENT IS SEPTIC WITH PNEUMONIA. You are trying to order a fluid bolus and start administering antibiotics promptly.

"WARNING!" the system proclaims. There is no weight on file for this patient. You must enter a reason why you wish to proceed with your order of 1,000 mL normal saline solution."

"WARNING!" The patient has a documented allergy to penicillin. You must enter a reason why you wish to proceed with your order of cefepime."

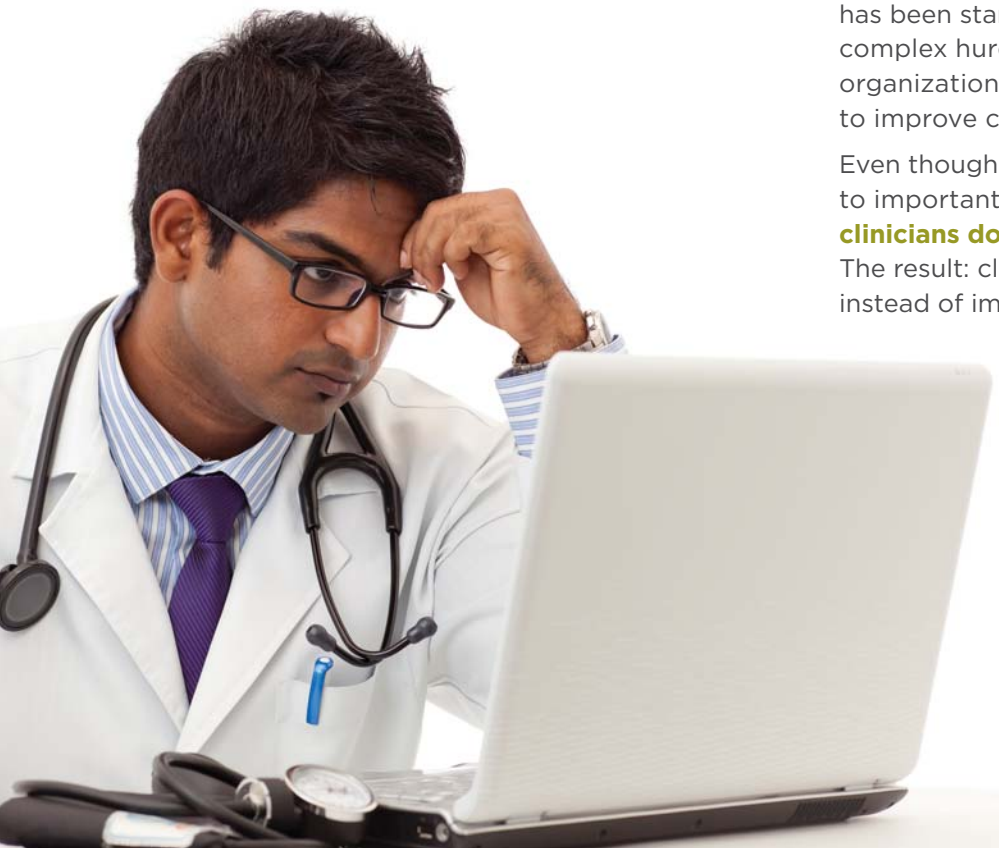
You sigh, recalling the very low cross-reactivity between cefepime and penicillin. When you attempt to also order vancomycin: **"WARNING!"** The patient has had a previous adverse reaction to vancomycin. You must enter a reason why you wish to proceed with your order of vancomycin."

"What's that?" you think to yourself. "Didn't we just do this?" You click to get past the pop-up and order the antibiotic anyway. About an hour later, a nurse has turned off the vancomycin infusion, asked you to order diphenhydramine, and is filing an incident report about a preventable adverse medication reaction.

This fictional, yet common scenario, which was presented in the *Annals of Emergency Medicine*[1] illustrates how the desire to do good by leveraging a set of innovative technologies and processes can actually lead to unintended consequences.

The situation is painful because basic intuition says that medication alerts generated by clinical decision support (CDS) can and should improve care.

After all, CDS solutions are designed to help clinicians recognize and react to potentially dangerous situations and stop patients from taking medications when drug-drug interactions, drug allergies or dosing miscalculations could cause harm.



Clinicians instinctively OVERRIDE ALERTS instead of implementing an override monitoring plan.

Sadly, though, for quite some time, alert fatigue has been standing in the way as an extraordinarily complex hurdle that is difficult to clear for organizations trying to leverage CDS systems to improve care and achieve Meaningful Use.

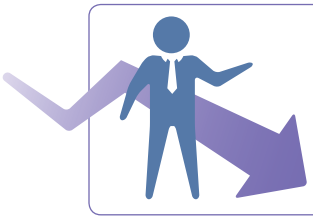
Even though alerts generated by CDS call attention to important information, **excessive alerts wear clinicians down**, resulting in boy-cries-wolf scenarios. The result: clinicians instinctively override the alerts instead of implementing an override monitoring plan.

CPOE ALERTS:
OVERRIDDEN AT AN ALARMING RATE

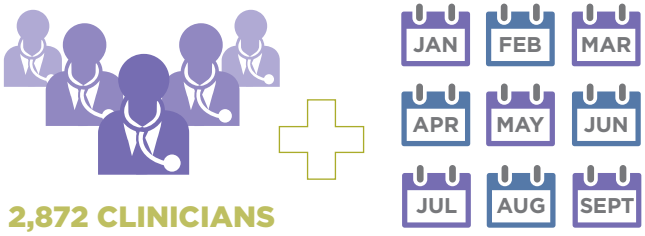
...ignoring and overriding medication alerts is widespread and can potentially LEAD TO UNDESIRABLE CONSEQUENCES

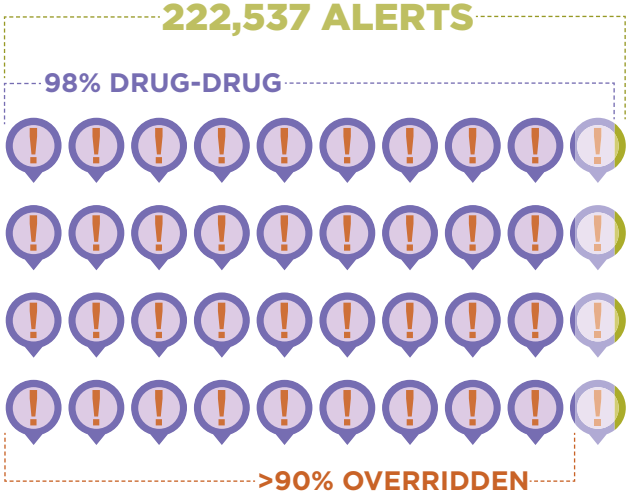
Consider the following: In 2009, researchers at the Boston-based Beth Israel Deaconess Medical Center and the Dana-Farber Cancer Institute looked at the safety alerts generated by 2,872 clinicians through 3.5 million electronic prescriptions over a nine-month period. Of the 233,537 alerts, 98 percent were drug-drug interaction issues, more than 90 percent of which were overridden.[2]

A more recent 2013 study, published in *JAMIA*, the *Journal of the American Medical Informatics Association*, showed improved override rates with only about half of alerts overridden by providers, with half of those overrides classified as appropriate. Authors concluded that further refinement of these alerts could improve relevance and reduce alert fatigue.[3]



A 2013 study showed a DECREASE IN OVERRIDE RATES. With only about half of alerts overridden by providers—half of those overrides classified as appropriate.





All in all, these studies conclude that clinicians are indeed overriding medication alerts at alarming rates. Although the industry has made progress in addressing alert fatigue during the time the data from these studies were being analyzed, these studies clearly support what most healthcare professionals already suspect: The practice of ignoring and overriding medication alerts is widespread and can potentially lead to undesirable consequences.

JUST THE RIGHT LEVEL:
ADDRESSING ALERT OVERRIDE RATES

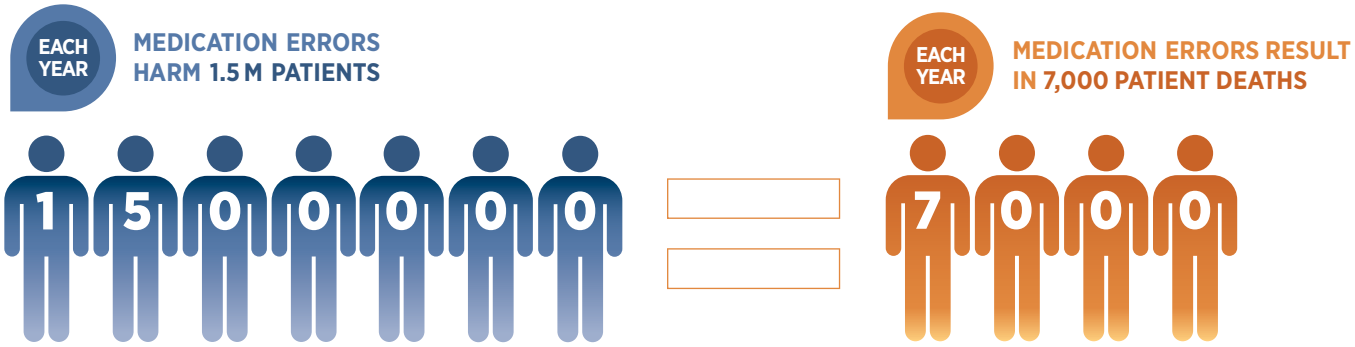
But the alert fatigue conundrum should not prompt healthcare organizations to throw in the proverbial towel. Instead, **organizational leaders should concentrate on building successful initiatives that manage alert fatigue**, empowering clinicians to effectively use CDS to make better decisions at the point of care.

After all, the industry is not ready to dismiss the Institute of Medicine's (IOM) much ballyhooed call for action, espoused in the July 2006 report that estimated that medication errors harm 1.5 million patients annually, with 7,000 deaths. The IOM Report said electronic prescribing, especially clinical decision support, is central to reducing the toll of these drug errors.[4]

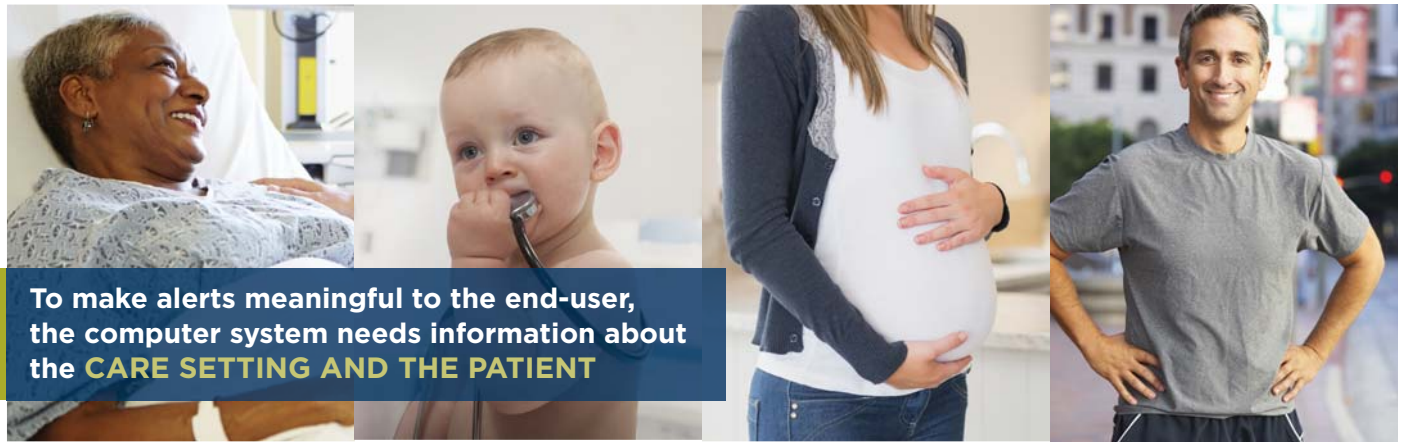
The mission, then, is to **make CDS work as it is intended to.** The problem is that making alerts less of a nuisance and more of a necessity is far from simple. The big hurdle for healthcare organizations: How can we implement CDS that offers just the right level of alerts? And, how can we make them more relevant and specific?

Healthcare leaders need to start examining why it is so difficult to find that "just-right" level of alerts—and then, perhaps more importantly, find a way to **implement a system that optimally leverages CDS at the point of care** while providing warnings that actually mean something to individual clinicians in specific care settings. An easier-said-than-done proposition if ever there was one.

IOM REPORT



IT'S NOT SIMPLE:
THE COMPLEXITY OF ALERT MANAGEMENT



To make alerts meaningful to the end-user, the computer system needs information about the CARE SETTING AND THE PATIENT

Before leaders attempt to address the alert fatigue problem, they should probably first acknowledge just how complicated the issue is.

To start, consider the fact that human beings are extraordinarily unique and complex. So, **an alert that might save a life in one situation could do absolutely nothing for another.** To make the alerts appropriate and meaningful to the end-user, the computer system needs to know a thing or two (or three or four) about the care setting and the patient that is sitting in front of the clinician.

To illustrate the case in point: An alert for the additive side effect of QT prolongation from co-administration of escitalopram and levofloxacin could be considered for alert suppression in a healthy 32 year-old male athlete. In contrast, such an alert is significantly more important in a 75 year-old female with CHF and low potassium and likely should be viewed by the prescriber.

In short, to offer alerts with increased patient relevance, the computer system would need to contain codified data that sheds light on the unique clinical situation and predisposing factors presented by each and every patient.

The utilization of patient parameters within CDS systems, **such as lab values and co-morbidities,** could also go a long way to help address alert relevance problems, and hence alert fatigue.

For example, if a drug-drug interaction alert for warfarin/fluconazole is going to tell the clinician to manage the patient by closely monitoring the patient's International Normalized Ratio (INR), and the patient already has an order for daily INRs indicated in the EHR, then the facility could certainly choose to suppress the interruptive alert during the inpatient order entry processes because the appropriate action plan is already in place.

The utilization of patient parameters within CDS systems could also go a long way to help ADDRESS ALERT RELEVANCE problems.

Alerts can also be more easily customized when the EHR system has a patient problem list in their records. According to Adventist Health System Chief Medical Informatics Officer Phil Smith, MD, **alerts are becoming easier to customize as more data are available in EHR systems to help refine them.** For example, now that 90% of Adventist patients have a problem list in their records, the hospitals in their system can refine the alerts to be only relevant to patients with particular conditions.[5]

Care Settings and Clinical Specialties Play a Role in Alert Management

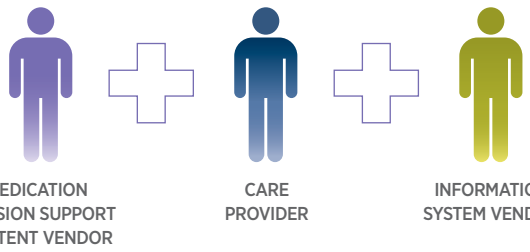
Patients are not the only complexity in the overall alert fatigue equation, though. Individual organizational settings and clinicians offer up plenty of complexities as well. Think about it: **An alert that is relevant in the outpatient environment may not be appropriate in the inpatient setting.** Even within the inpatient setting, an alert that is relevant on the internal medicine ward may not be relevant in the operating suite or in the emergency department. And, what's more, hospitals often have specialized needs due to their specialized patient populations (e.g., hospitals with centers for excellence versus teaching hospitals versus community hospitals).

Alerts also need to be relevant to the individual clinicians who receive them. Consider the following: **A cardiologist and an orthopedic surgeon are apt to require different alerts, even when working with the same patients.** The cardiologist may not need to be reminded of the potential dangers associated with administering low-dose aspirin to a patient also taking blood thinners every time he or she sees a patient. Whereas, an orthopedic surgeon seeing the same patient for an intake appointment for hip replacement may need this warning as the combination of medicines could lead to excessive bleeding during surgery.

Adding even more complexity into an already hard-to-crack problem is the fact that the issue of alert fatigue can't be solved without consensus and cooperation.

Instead, the complexity of the problem requires that the medication decision support content vendor, the information system vendor and the care provider, must all move in unison and collectively address alert fatigue in a coordinated manner.

The issue of ALERT FATIGUE can't be solved without consensus and cooperation



The "Just-Right" Challenge Requires a Unique Approach

With all this complexity, the task at hand is a difficult one, indeed. Over the years, as more CDS systems were adopted, **hospital leaders have expressed a need to fine-tune medication alerts** not only for drug-drug interactions, but for duplicate therapy, and dose checking. Until only a few years ago, the challenge had been especially daunting because many healthcare information system vendors did not offer much, if anything, in the way of flexibility to their end users to fine-tune the drug alerts within the CDS system. At a minimum, adjusting severity levels of drug interaction pairs was offered but only in limited cases.

ADDRESSING ALERT FATIGUE:
FDB—A THREE-PRONGED APPROACH

In order to fully address the complex problem of alert fatigue in EHR systems, the industry needs a team-based approach. If there ever was a case where both sides of the proverbial coin need to work in unison—the drug content provider and the system vendor—this is the one.

The role of the drug knowledge provider is critical in helping end users manage medication alerts. As an industry leader, **FDB is in a pivotal position** to do as much as possible with our system vendor customers to help provide their end users with as much flexibility as is clinically relevant when using our drug knowledge.

At FDB, it is a strategic company imperative to address the problem of alert fatigue with a multi-faceted approach. We call this our "three-pronged strategy." And, it has been a key focus of our company for the last decade as more and more EHR systems and CPOE "go-lives" started to occur with regular frequency and over alerting became an acute problem facing our customers.

PRONG ONE: Fine-Tune, Fine-Tune and Then Fine-Tune Again

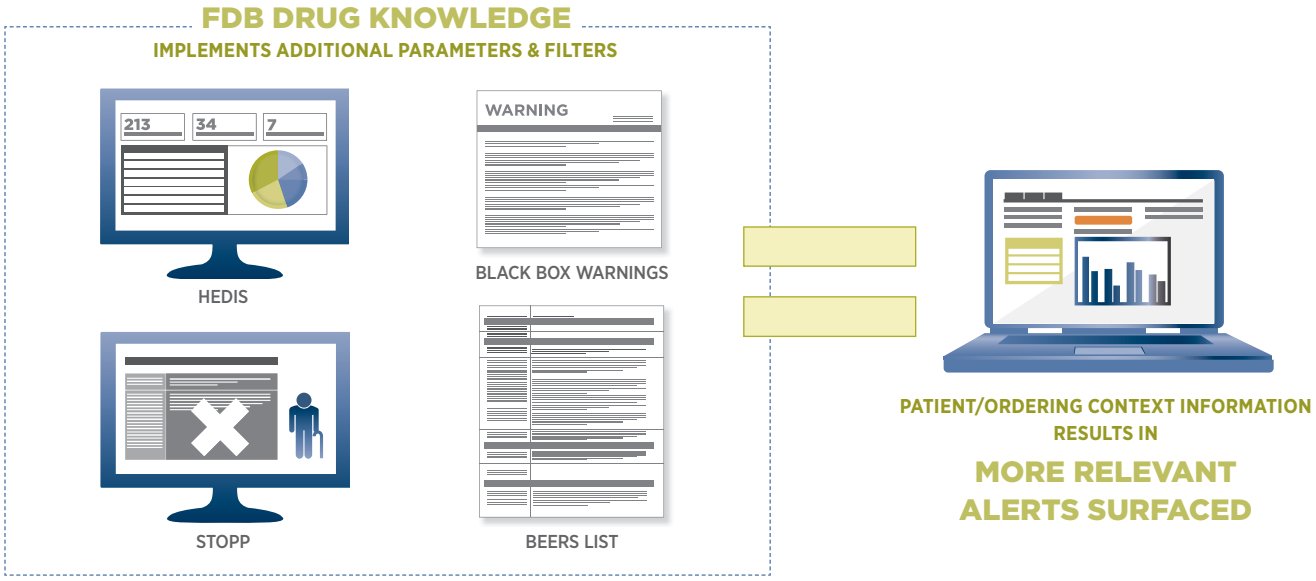
The first prong of this strategy is the work that our clinical experts do on an ongoing basis to fine-tune our drug knowledge within existing modules and data structures.

For example, after much study and conversation with our customers, we chose to "unhook" all of the non-antibiotic sulfonamide drugs from being cross-sensitive to sulfonamide antibiotics in our drug-allergy module.

This action was taken as a direct result of research conducted by FDB clinicians and published in the *American Journal of Health Systems Pharmacy* in 2013.[6] In addition, we removed a common pain medication (morphine) from triggering a morphine-linezolid antibiotic interaction, and ratcheted up the duplication allowances on the anti-seizure meds, laxatives and some cough and cold preparations.

We also work to secure alerting data from our system vendor end users from a variety of hospitals across the United States and from various care settings. This "real world" alerting data is then studied closely in order to uncover trends and areas in which our clinical teams should focus their evidence research and refinement efforts.

For example, in 2010, **we analyzed 820,841 alert records spanning seven weeks from four hospital systems using a major hospital EMR vendor.** We analyzed more than 60,000 drug interaction "severity level 2" alerts, where 65% of the alerts were overridden. We made modifications to remove cefazolin, a common antibiotic used for surgical prophylaxis that was alerting with anticoagulants. We also eliminated duplicate therapy alerts between injectable narcotics and oral antitussives, intentional diuretic combinations, and between low-dose aspirin and NSAIDs.



PRONG TWO:
Implementing Additional Patient Parameters

The second prong in our strategy is to implement additional parameters and filters in our drug knowledge to surface more relevant alerts to clinicians. The vision is to only fire alerts relevant to the individual clinician treating a single patient at a unique moment in time. This approach requires both the drug content provider and the EHR system vendor to work in concert together to make this occur seamlessly.

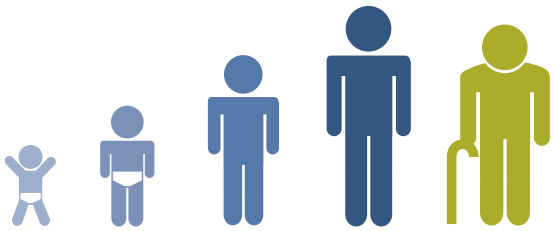
Consider for a moment the universally recognized need to **have lab values accessible by certain types of CDS as the clinician builds the electronic drug order.** A prime example is the interaction between an ACE inhibitor and a potassium supplement, resulting in dangerously high potassium levels.

In this scenario, the system should be able to identify the last time the patient had a blood chemistry panel performed as well as the last serum potassium result. Depending on the potassium result, this patient-specific information could then be used by the system to filter the drug interaction alert from view or push it to the clinician as a priority alert.

For this example to succeed in a real-world scenario however, both the drug knowledge and EHR system patient data would need to work in concert.

The good news: implementing additional clinical parameters and filters from the drug knowledge content perspective—independent of the EHR system—is one that FDB is actively addressing.

The use of age as an additional parameter has added focus on specific patient populations. For example, geriatric patients, who are more likely to have some degree of kidney dysfunction, often require greater degrees of clinical assessment and referral to additional sources of information for appropriate drug dosing. FDB has incorporated this information as creatinine clearance thresholds.



The USE OF AGE as an additional parameter has added focus on specific patient populations

Geriatric patients are also susceptible to drug-related adverse outcomes and should avoid certain medications where possible. We provide this type of care guidance via the Beers List, STOPP and HEDIS data indicators which identify high risk drugs in the elderly. Additionally, we are deploying extensive drug content for high risk drugs with boxed warnings that will include relevant patient condition parameters such as low blood counts and pregnancy.

PRONG THREE: Enable Organizations to Customize Medication Alerts Based on Local Experience

Customization of medication alerts has long been proposed by clinician thought leaders as early as 2007. An oft-cited review article authored by Gilad J. Kuperman, MD, PhD, Director of Interoperability Informatics at New York-Presbyterian Hospital, and published in *JAMIA*, concluded: **"Significant advances can be made in addressing medication alert fatigue if tools existed that allow organizations to more easily customize the drug knowledge… to diminish the frequency of clinically unhelpful alerts.** The ability to customize interaction severity levels, filter out specific classes of interactions, and accomplish these in a manner that is unaffected by successive updates have been identified as recommendations."[7]

To help address this third prong in our strategy, FDB brought to market the industry's first-ever solution to managing and customizing medication alerts directly from the content source, FDB AlertSpace®. This web-based alert management solution makes it possible for clinicians to customize multiple medication alert categories in ways as unique as the organization deploying it.

More specifically, FDB AlertSpace enables clinicians to collaboratively fine-tune medication alerts for:

- Drug-Drug
- Drug-Allergy
- Drug-Disease
- Precautions
- Drug-Dosing
- Duplicate Therapy

It enables clinicians to develop institution-specific modifications of medication alerts using clinical data modules based on clinician input, localized experience, and other available evidence; edit or turn off individual alerts; track all alert customizations; create an audit record; and load the results of modifications directly into the decision support system for immediate use in the workflow.

To take full advantage of AlertSpace, clinician leaders may choose from several customization strategies to best fit their unique situation. If they determine that only a few alerts are warranted, an organization can start with a "blank slate" approach, where all alerts are turned off and the user selectively turns alerts on as needed. Alternatively, when a large number of alerts are required, an organization can use the "fine-tune" approach, where all alerts are initially activated and users selectively turn certain alerts off.

ONC subsets provide a "starter set" of HIGH PRIORITY INTERRUPTIVE ALERTS for prescribers.

FDB AlertSpace also empowers organizations to leverage existing subsets in an effort to make the alerts more relevant to specific patients and scenarios. For example, clinicians have easy access to published reports and industry standard subsets to assess alert modifications. The widely acknowledged "ONC subsets" provide a "starter set" of high priority interruptive alerts for prescribers, as well as a low priority, non-interruptive drug interaction subset created by consensus process that was sponsored by the Office of the National Coordinator for Health IT (ONC).[8]

Prong Three: Continued

And, by leveraging additional parameters and filters that FDB has provided—such as the Beers List, STOPP and HEDIS indicators for geriatrics, and pharmacogenomics and boxed warnings for high risk drug-disease interactions—organizations can efficiently customize alerts to ensure they are applicable to the unique care delivered to individual patient populations.

Previously, if an organization made a customization to an alert, then they were required to maintain it—putting the onus on their shoulders to keep up with all the changes to the medical literature about those particular drugs and interactions. And, no one in a busy point-of-care hospital setting wanted or needed to take on that responsibility.

With AlertSpace, users can more easily keep their customizations up to date because they can use FDB changes as a trigger. If FDB has made any changes to the alerts they have customized through AlertSpace, they can take a look with just one click and use this view into the data as a trigger to decide whether they want to retain their customization—as scheduling permits.

The end result: **each organization is able to leverage highly specific decision support without a barrage of unnecessary alerts.**

FDB's three pronged approach to addressing alert fatigue has evolved, and WILL CONTINUE TO EVOLVE while continuing to push the mark clinically.

Clinicians are collaborative by nature and this area is no exception. With AlertSpace, clinicians can collaboratively build on their local experiences with key medication alert categories. AlertSpace also provides a means to learn from the experience of other provider organizations, without having to blindly adopt what others have done.

AlertSpace provides a means to LEARN FROM THE EXPERIENCE of other provider organizations

For example, **AlertSpace makes it possible to "crowd-source" helpful modifications** by displaying all of the most commonly-customized alerts with notations also visible. By doing so, clinicians can quickly see what alerts are proving to be challenging at other organizations, make a decision on the alert modification at their organization and communicate with the online AlertSpace community. Such functionality enables organizations to streamline the alert management process, while still making it possible to customize alerts to fit very specific organizational needs.

As outlined here, FDB's three pronged approach to addressing alert fatigue has evolved, and will continue to evolve while continuing to push the mark clinically.

ALERT MANAGEMENT:
WHAT DOES THE FUTURE HOLD?

As industry experts and health care organizations work together to alleviate alert fatigue, it's clear that the answer is to **create systems that take human behavior and supplemental patient data into accoun**t when writing rules that decide when and why an alert fires and what actions need to be taken. But what does the future look like in addressing alert fatigue?

At FDB, for future alert management opportunities, we are continuing to introduce other clinical data that cover patient-specific, physician-specific and drug-specific parameters including pharmacogenomics, timing of medications and others.

This challenge requires a sophisticated answer that will only come about when ENTITIES across the industry WORK IN UNISON.

CONCLUSION

Here, we've outlined the alert fatigue solution from a 35,000 foot perspective. In a series of corresponding blogs, we will provide some insight and details on how to move this approach from concept to reality.

First, we will explore why this complicated challenge requires a sophisticated answer that will only come about when entities across the industry work in unison. Then, we'll take a deep-dive look at some specific strategies associated with fine-tuning existing content; creating additional alert filters and parameters; and customizing alerts.

By taking these actions, we believe that when it comes to alerts, the industry can and will eventually get it "just right."

Continue this conversation online. Read *KnowHow: The FDB Blog* and let us know what you think. www.fdbhealth.com/blog

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