SAFETY IN MANAGING PATIENT TEST DATA: ASSESSING PERCEPTIONS, ATTITUDES, AND ACTIONS

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As a gateway to specialty care, primary care relies on patient testing—including laboratory work and imaging—for many kinds of patient diagnoses and treatments. Because of this, patient safety can be adversely affected when testing orders are not tracked, results are lost, or patients are not notified of results. Non-standardized testing management also worsens clinical outcomes, lessens system resilience, and increases clinician workload, costs, and delays. During development of a system to better support patient test tracking, a survey was performed to assess perceptions, attitudes, and actions of current healthcare practitioners. Responses from 261 people show a variety of experience with the phrase “no news is good news” for testing results, attitudes and reactions about health technology, perceptions of usefulness and time consumption of safety-related actions, and failures and successes observed throughout testing management processes.

INTRODUCTION & BACKGROUND

An essential part of primary care, patient testing must be managed well to achieve the right care in the right time, amount, site, and setting with the right information and personnel in the right specialty (Hickner et al., 2005; Wakefield, Ward, & Wakefield, 2007). Non-standardized testing management decreases patient safety; increases clinician workload, costs, and delays; and worsens clinical outcomes (Battaglia et al., 2010; Schiff et al., 2009; H. Singh et al., 2009b; Wahls & Peleg, 2009; Wald et al., 2007). This research is focused on answering the test tracking and safety needs identified by a study of testing management practices in four Southwest Ohio primary care offices (Elder, McEwen, Flach, & Gallimore, 2009).

Resilience in Testing Processes

Resilience is the ability of a system to successfully maintain or return to a stable state in spite of variable conditions; it is a pro-active, continuous process of learning from the past, responding to the present, monitoring critical events, and anticipating future system changes, stresses, and sudden threats (Hollnagel & Woods, 2006; Hollnagel, 2011; Westrum, 2006; Wreathall, 2006). Resilient systems must increase system standardization and stability while still supporting a flexible capacity to adjust to changes (McDonald, 2006). Characteristics of resilience include top-level commitment, just culture/openness, learning culture, opacity /observability of safety boundaries, awareness, preparedness, and flexibility (Wreathall, 2006).

From a resilience engineering framework, Elder, et al. (2008, 2009) used interviews, observations, chart reviews, patient surveys, and other notes to audit results management practices and to identify safety, successes, workarounds, critical incidents, communication, leadership, and teamwork in testing management. Top-level management commitment and learning cultures (where problems were addressed for reform) were the most common resilience properties they found (Elder, McEwen, Flach, & Gallimore, 2008).

Patient Test Tracking

For system resilience and patient safety, there is a need for systems to track when orders have been lost, when results are delayed or lost, or when patients have not been notified of their results (Bruder, 2001; Elder et al., 2008; Elder et al., 2009; Vance, 2008). Tracking problems exist even in organizations using electronic medical records (EMR) because the technology may not provide a full awareness of testing processes and individual responsibility, and because users may assume the technology is a catch-all safeguard to provide tracking and follow-up functions that it lacks (Casalino et al., 2009; Elder et al., 2008; Elder et al., 2009; Hysong et al., 2009; McEwen, 2008; H. Singh et al., 2009a; Wahls & Cram, 2009).

Elder, et al. (2008, 2009) found that management protocols, overall safety awareness, and commitment to tracking varied both between offices and among providers in each office. In some offices, safety was created from individual workarounds to dysfunctional systems, such as personnel making back-up copies of test orders or writing patient names on sticky notes.
Critical incidents included the laboratory losing the test orders; results accidentally being thrown away, lost, or filed in the wrong chart; patients calling for results from tests that were never ordered; and abnormal results follow-up being delayed for six months because not all results in the test panel had returned (McEwen, 2008). Results management sometimes relied on personnel remembering to double-check on specific testing orders; one clinic’s EHR was not designed to immediately link original orders to the incoming results, and the staff did not have a routine to check outstanding orders with no results (Elder et al., 2009).

In a patient survey in all four clinics, most patients (87-100%) said they received test results; however, 58-85% of charts showed patient notification, 47-84% of charts showed physician review of results, and only 28-55% of charts showed follow-up for abnormal results (Elder et al., 2009).

A health information technology (HIT) solution could support safety in testing management, could provide both standardization and flexibility in the processes, and could reduce reliance on individual memory as a primary means of tracking. Research is currently being performed to develop a system to answer these needs.

Socio-Technical Issues

Because any HIT solution would be implemented into a socio-technical system, it is important not only to understand how cultural attitudes, experiences, and perceptions affect usage and acceptance of HIT but also to understand how the HIT itself can affect processes, communication, attitudes, perceptions, successes, and failures (Ackerman, 2000; Harrison, Koppel, & Bar-Lev, 2007; Te’eni, 2001; Wears, 2005; Wears, Cook, & Perry, 2006). Therefore, during system development, a survey was designed to understand user attitudes, perceptions, & actions to better design technology that meets user needs and increases safety in managing testing data.

OBJECTIVES AND METHOD

Objectives and Survey Design

As part of the testing management system development, a survey was designed to:

1. Assess perceptions, attitudes, and actions of practicing clinicians and healthcare administrators in relation to safety, testing management, and technology issues.
2. Examine what aspects of safety, testing, and technology literature have been implemented, have succeeded, or have failed in healthcare settings.
3. Highlight user needs and attitudes to improve the testing management system’s usability and to inform system design and evaluation.

The survey included questions related to demographics, health information technology experience and attitudes, perceptions of usefulness and time consumption of safety-related actions and processes, experience with the phrase “no news is good news,” and failures and successes observed in testing management processes. A list of the survey question categories is shown in Table 1.

Table 1. Survey question categories

<table>
<thead>
<tr>
<th>Topic</th>
<th>Details</th>
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<tbody>
<tr>
<td>Demographics, Background, &amp; Experience</td>
<td>• Age &amp; gender</td>
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<td>• Years of experience</td>
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<td></td>
<td>• Regions/countries of experience</td>
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<td>• Fields of credentials/ expertise</td>
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<td></td>
<td>• Location of work experience (types of healthcare facilities)</td>
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<td></td>
<td>• Health information technology experience</td>
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<tr>
<td>Patient Safety &amp; Technology</td>
<td>• “No news is good news” experience as a provider and as a patient</td>
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<td></td>
<td>• Effectiveness vs. time of patient safety issues</td>
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<td></td>
<td>• Technology experience and attitudes</td>
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<td></td>
<td>• Safety attitudes</td>
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<tr>
<td>Testing Process &amp; Tracking</td>
<td>• Effectiveness and problems in the testing processes</td>
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<td></td>
<td>o Before &amp; during testing</td>
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<td></td>
<td>o After testing</td>
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<td></td>
<td>• Tracking methods – previous use and/or willingness to use different methods to remember to keep up with an unusual case</td>
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Subject Recruitment and Apparatus

People with a range of clinical experience or healthcare management experience were invited to participate, including physicians, nurses, physician assistants, office managers, upper-level nursing or medical students, those in medical residency or fellowship, other healthcare administrators, or other providers who have had experience with patient testing processes. The survey was hosted on SurveyMonkey.com, and the link was distributed electronically to eligible healthcare populations from Wright State University and to the research team’s healthcare contacts, primarily in Southwest Ohio.

RESULTS AND DISCUSSION

This section includes results from the questions in Table 1, along with discussion about each question. Overall discussion is at the end of the report.
Participants

The survey had 261 respondents whose healthcare experience varied from less than a year to 41-45 years. Average experience was 15 years (n=261) and average age was 42 years (n=185). For gender (n=183), 157 respondents were female (85.8%) and 26 male (14.2%). The types of healthcare facilities in their experience is shown in Figure 1. Participants had a variety of credentials and work positions in their experience, as shown in the bulleted list in this section. The numbers of responses in each category of credentials are:

- Nursing (RN, BSN, NP, other) – 191
- Assistant (NA, MA, CNA, PCT, PA) – 57
- Medical or nursing student – 33
- Medicine (MD, DO) – 28
- Administration & Information Technology – 28
- Allied health – 19
- Clerical – 17
- Clinical educator – 12
- Other – 45

Technology experience is shown in Figure 2. Respondents were most experienced in electronic medical records, patient care/clinical technology, and health information libraries. The technologies with the least experience were telemedicine (at-home patient monitoring), telemedicine (real-time video interaction), and decision support systems.

“No News is Good News”

The Agency for Healthcare Research and Quality (AHRQ) encourages patients never to accept that no news means good news (Agency for Healthcare Research and Quality, 2009). When patients hear nothing about their results, it could actually mean that the order was lost, abnormal results were not properly linked to the original order, or the testing referral was lost in the EMR system. However, clinicians are still using this phrase, and patients are still hearing it in their interactions.

Results showed 48 of 154 respondents (31.2%) either have told patients or would consider telling patients “no news is good news” about their testing results. The majority (68.8%) have never told patients that phrase. However, 77 of 117 (65.8%) have heard it from a medical provider; only 40 of 117 (34.2%) have never heard it from a medical provider. Comments included:

- “I tell patients never to accept this phrase”
- “No news means that the patient should be calling to confirm that the results have been reviewed and were okay.”
- “Patients deserve the confirmation that they have had good test results, whether by phone or mail. As a patient…I call anyway to verify that I really have had "good news" and not been missed for a phone call.”

The result showing that 31.2% of providers have or would tell patients “no news is good news” is similar to Casalino, et al. (2009), who showed that 34.8% (8 of 23) clinics surveyed used that “dangerous practice.” In that study, many clinics had no explicit patient-notification rules, and individual providers would set up their own protocols (Casalino et al., 2009).
Safety Actions: Effectiveness vs. Time

Participants were given a list of safety actions selected from Elder et al. (2008, 2009), from McEwen (2008), and from the researchers’ previous observations in healthcare and manufacturing environments. If applicable from their experience, participants rated the effectiveness of those patient safety actions on a scale of 1 to 7 (1=extremely ineffective, 4=effective, 7=extremely effective) and the time required for those actions on a scale of 1 to 7 (1=requires very little time, 4=moderately time consuming, 7=extremely time consuming). Results for each patient safety action were filtered to include only the answers that included both an effectiveness rating and a time rating, leading to a different n for each item. The grid showing Quadrants I –IV of being more/less effective and requiring more/less time is shown on Figure 3.

Item PS8 (patient safety checklists) had the highest effectiveness rating in Quadrant I. The most commonly used safety actions were PS10 (visual safety reminders or announcements) with n=190 and PS14 (verbally repeating information that is on paperwork) with n=188. The least used action was PS2 (color-coding) with n=144.

More time consuming items included PS5 (follow-up on lists of outstanding patient tests that are missing results) and PS4 (double-check others’ work or pick up where others seem to leave slack). For testing management, both of these items can be addressed by an HIT system that supports and expedites the auditing and reconciling processes and makes them part of the entire clinic system so that they are not performed individually by a beleaguered staff member.

Other time-consuming items were quality improvement teams and various types of training (cross training for team absences, training for a new technology, and training after mistakes occur). These were all in Quadrant II, showing a greater effectiveness.

All items were rated as effective or better, except for PS9 (meetings, committees, or safety-related speeches from management). However, top-level commitment from management is an important part of resilience and safety culture (Guldenmund, 2000; Wreathall, 2006). This has implications for designing HIT that shows management commitment to safety without distancing clinicians from an overt management safety message in the interface.

The majority of items (9 of 14) were rated as moderately to extremely time consuming. The balance of time for these is discussed more in the next section.

It is promising that item PS1 (asking patients to call about their results) was rated at a lower effectiveness; however, it was still in the “effective” range. Systems should be designed so that relying on patients to check on their own results is not a primary safety method.
Reactions to New Technology, Programs, and Procedures for Patient Safety

Based on their own experience, participants were asked to rate a list of potential attitudes and reactions to new technology, programs, or procedures for patient safety from 1 to 7 (1=strongly disagree, 4=neither agree nor disagree, 7=strongly agree) and results are shown in Figure 4.

Participants showed a general openness to change and positive attitudes with their disagreement to items RA2, RA15, and RA16 and their agreement with RA3, RA5, RA6, RA8. This kind of pro-active attitude from respondents is also shown in the disagreement with RA2, “I just do what I’m told to do.” The results in RA2 and RA13 show that any HIT needs to be designed to track usage data, to track and respond to individual workarounds as valid feedback, and to seek feedback about individual safety actions in order to revise the HIT and support a learning culture.

This attitude of openness somewhat explains the disagreement with RA14, that “this takes away too much of my decision-making power.” Previous studies have shown that some physicians were resistant to adopting EMR because of concerns that it would take away professional autonomy (Ford, Menachemi, Peterson, & Huerta, 2009).

Respondents agreed with R8—that the new patient safety actions are “important & must be done, no matter the cost or time”—and disagreed with R9, that patient safety actions are “important & must be done, but we don’t need to spend too much time and money for it.”

The agreement with R8 could indicate support for items in quadrant II in the previous question (the more effective items requiring greater time); in the previous question, 9 of 14 safety actions were rated as moderately to extremely time consuming. However, there are implications for time conflicts among all of these items; what slips when there is not enough time for them all? Given the high ratings on RA1, “my patients come first,” how do clinicians prioritize how to spend their time when there is a conflict between a patient care action and safety-related paperwork? While some clinicians may say that any patient safety action must be done despite the time cost, there are limitations to human capabilities, memory, information processing, and error-proofing under stress, high workload, and fatigue.

Successes and Failures in Testing Processes

Participants were given a semi-chronological list of steps that can occur before, during, and after the actual test (e.g., analyzing blood sample) is performed. If applicable, participants rated their perception of the frequency of problems in each step on a scale from 1 to 7 (1=rare problems, 4=moderate problems, 7=abundant problems).
There was a large variation in the number of replies (n=72 to n=160) because providers and administrators do not see the entire testing process and can rate the parts they contact (e.g., a provider who sends a sample to the lab may not have contact with receiving test results).

As shown in Figure 5, every phase in the testing process was rated less than 3.5, somewhere between rare to moderate problems for each phase of testing. This was an unexpected average perception because of primary care testing errors cited in literature. This is likely because most participants were affiliated with hospitals and were not rating primary care testing problems; many comments discussed timeliness and criticality of hospital lab processing, rather than potentially weeks- or months-long processes in primary care. However, analysis of the comments shows common themes.

**Successes.** These included reducing people and steps in the process (e.g., radiology calls patients directly), creating new standard wording for orders, and a new, more efficient procedure to draw blood and transport vials directly to the lab. Others mentioned EMR and bar-coding successes, convenience of EMR systems that communicate with each other, helpfulness of emailing test results, and new patient portals for patients to access their own testing results.

**Communication and patient follow-through.** In each phase of testing, patients were cited for being “no-shows” at outpatient lab appointments because they forgot, because they could not afford it, or because they never received complete instructions from the provider about going to the lab or why the test was needed. Patients were also cited for providing incorrect contact phone numbers. Providers going on vacation have created delays by not communicating to their residents or medical students about outstanding tests or tests to be ordered.

**EMR technology.** Different computer systems do not communicate (e.g., lab vs. the clinical EMR), errors and delays are caused when transferring between paper and EMR records from different healthcare systems, and the EMR designs are forcing clinicians to alter their jobs. Delays are caused when clinicians do know the exact name or abbreviation used by the EMR for a test, either because the EMR is not using the right abbreviation, or because it is a test the clinician does not order frequently. Delays are also caused by excessive clicking among screens in the EMR to perform basic tasks.

**Other failures.** Faxing orders to an external facility “which tends to never receive the fax, lose the fax, misplace it, put it in a stack and forget about it, and so forth” causes delays. Radiology results are not automatically sent to the clinic that ordered the test.

### Table: Average perceived frequency of problems in testing processes

<table>
<thead>
<tr>
<th>Code</th>
<th>n=</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDT1</td>
<td>152</td>
<td>Determining which tests to order</td>
</tr>
<tr>
<td>BDT2</td>
<td>157</td>
<td>Ordering testing</td>
</tr>
<tr>
<td>BDT3</td>
<td>156</td>
<td>Taking &amp; preparing sample for lab</td>
</tr>
<tr>
<td>BDT4</td>
<td>153</td>
<td>Transporting samples to the lab</td>
</tr>
<tr>
<td>BDT5</td>
<td>146</td>
<td>Receiving notice from the lab about which testing orders were received</td>
</tr>
<tr>
<td>BDT6</td>
<td>127</td>
<td>Scheduling or instructing pt for outside testing</td>
</tr>
<tr>
<td>BDT7</td>
<td>128</td>
<td>Performing test (e.g., scanning, analyzing samples)</td>
</tr>
<tr>
<td>BDT8</td>
<td>160</td>
<td>Tracking whether test results have been returned</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>n=</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT1</td>
<td>150</td>
<td>Receiving test results</td>
</tr>
<tr>
<td>AT2</td>
<td>143</td>
<td>Reviewing test results to determine next actions</td>
</tr>
<tr>
<td>AT3</td>
<td>143</td>
<td>Documenting review of results</td>
</tr>
<tr>
<td>AT4</td>
<td>129</td>
<td>Notifying patients of their results</td>
</tr>
<tr>
<td>AT5</td>
<td>126</td>
<td>Documenting patient notification</td>
</tr>
<tr>
<td>AT6</td>
<td>72</td>
<td>Preparing results to mail to patient</td>
</tr>
<tr>
<td>AT7</td>
<td>118</td>
<td>As a pt, being notified of results</td>
</tr>
<tr>
<td>AT8</td>
<td>112</td>
<td>Setting up follow-up referrals/appts</td>
</tr>
<tr>
<td>AT9</td>
<td>125</td>
<td>Filing results into pt’s chart or EMR</td>
</tr>
<tr>
<td>AT10</td>
<td>134</td>
<td>Acquiring previous results of new/referred pt</td>
</tr>
</tbody>
</table>

**Figure 5.** Average frequency of problems in testing processes (Left: before and during testing; Right: after testing)
Tracking Testing with Unusual Circumstances

This question examined participants’ preferred memory aids in a case with asynchronous patient communication and results arrival. The question text said: “Consider a scenario where Mr. Smith has multiple tests and scans ordered at one appointment. Some of the results show abnormalities, but not all results have returned from the lab. You’re not sure if Mr. Smith made it to his referral appointment for scans, and he’s not responded to voicemails to schedule follow-up for the urgent, abnormal results. How would you remind yourself – or how have you reminded yourself – about keeping up with Mr. Smith’s case? Rate the likelihood of using these methods on a scale from 1 to 7 (1 = Would absolutely never do this, 4 = Unsure, 7 = Would definitely do this).” The different aspects of this scenario came from McEwen (2008) and Elder, et al. (2009) and the tracking choices are shown in Figure 6.

Because of the problems with test tracking shown in the literature, even for clinics using EMR, the ratings on TR4 (flag it in the electronic test tracking system) and TR9 (type a note or set a reminder in the EMR/EHR) were higher than expected. However, most survey participants were affiliated with hospitals and were experienced EMR/EHR users. It is unknown which EMRs participants were using.

The only items rated on the “would do this” side were TR2 (check printer/fax regularly), TR4 (electronically flag it), TR6 (post sticky notes), TR7 (put the chart in special location), and TR9 (note in the EMR).

There were some concerns with the methods, although they do confirm the reminders seen in McEwen (2008). For example, T3 (commit the patient’s name to memory) really should be closer to a 1. “would never do this” rather than being a slight disagreement or neutral rating (3.85). Clinicians may remember their patients’ names, but this cannot be a primary means of tracking.

T6 (post sticky notes) is also a concern because it risks information being lost, misplaced, or overlooked on the edge of a screen with months’ worth of sticky notes. Systems must be designed to support these kinds of reminders so that a posted sticky note is not a patient’s primary prevention to their test situation “falling through the cracks.”

Item T7 (using color coding/special locations) can be helpful but could introduce error if this is an individual workaround rather than a clinic-wide standard color coding system and special queuing location for these kinds of asynchronous, abnormal testing returns. McEwen (2008) found critical incidents where individuals would put a chart in a special location, but that the file room personnel would find the chart and mix it in with other charts; also, stashing a chart in a special location prevented other providers from accessing information they needed about the patient.

OVERALL DISCUSSION & CONCLUSION

There is a need for safety and resilience in testing management to reduce delays, to prevent missed results follow-up, and to ensure that patient care occurs at the right place, right time, with the right information. Technology should be designed to support testing management processes, to aid memory for asynchronous results arrivals, and to address the socio-technical aspects of individual perceptions, attitudes, and actions that affect technology usage.

The phrase “No news is good news” for test results is still being used in healthcare, which offers opportunity for
error. However, healthcare systems cannot rely on patients checking on their own results as a primary safety net.

The high participation of people with experience working in hospitals and with EMRs, and their corresponding attitudes, shows a promising technology acceptance and usage that offers potential for primary care. However, there are still concerns for tracking even in areas with an EMR, such as relying on sticky notes as workarounds to an incomplete system.

By surveying perceptions and actions of a variety of healthcare practitioners, this research has provided a new understanding of the perceived usefulness and perceived time required for certain safety actions, successes and failures in testing, preferred tracking methods, as well as attitudes and reactions to new technology. These results are now informing the design requirements for a system designed to better support testing management. The results also offer insight on preferred strategies to communicate both management support and changes to safety processes.

ACKNOWLEDGEMENTS

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REFERENCES


