The Institute of Medicine report “To Err Is Human” was based on a compilation of several studies in the medical literature on patient safety and medical errors. Errors not only cost patients their lives but also carry a multibillion dollar health care cost annually. The report emphasized that medical errors were not typically the result of individual miscalculations but were most commonly caused by “faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them.” It heralded a 21st-century health care revolution in patient safety, shining the spotlight on these issues and facilitating strategies for change.

Concurrently with the Institute of Medicine report, patient safety educational requirements were instituted for residency training by the Accreditation Council for Graduate Medical Education (ACGME). Residents are now required to work in teams to enhance patient safety, improve patient care quality, and help identify system errors and implement potential system solutions.

To establish a culture of safety in one’s own clinical practice, we believe it is beneficial to have experienced an effective patient safety culture during residency. Faculty who role model desired patient safety behaviors reinforce the local safety culture and strengthen residents’ patient safety foundation.
However, to our knowledge, dermatology residents have never been asked to report the patient safety role modeling behaviors of their faculty. The purposes of our study were therefore to identify gaps in individual and system patient safety practices as experienced by dermatology residents, identify the underlying factors that contributed to safety concerns, and suggest approaches to overcome deficiencies and produce a cadre of dermatologists in the next generation who embrace a patient safety culture.

Methods

This study was granted exemption from the Marshfield Clinic Research Foundation's Institutional Review Board. Permission to use the data was granted by the American Academy of Dermatology Council on Education and Maintenance of Certification. Study subjects included residents in all 3 years of training from US dermatology residency programs who were attending the Patient Safety session of the “Essentials in Medical Dermatology” resident course in Itasca, Illinois, sponsored by the American Academy of Dermatology. Residents were surveyed using audience response system software (Turning Technologies) during an interactive Powerpoint (Microsoft) presentation given by one of us (E.J.S.). Participation was voluntary, and survey responses were anonymous. Data from the audience response system was exported to Excel (Microsoft, 2010) for descriptive analysis.

Results

Demographics

Respondents included 142 dermatology residents from 44 residency programs in the United States and Canada (Table).

Awareness of Committing Errors

A total of 45.2% of residents reported that they have failed to report a needle-stick injury incurred during a procedure to the proper health and safety officials. Nearly all residents surveyed (96.7%) have experienced right-left body part mislabeling during examination documentation or biopsy specimen labeling. Many (82.8%) reported cutting and pasting a previous author’s past medical history, social history, or family history into a medical record without actually confirming with the patient that the contents were true. Finally, 89.9% of residents have been directly involved with a “near-miss” patient safety issue that readily came to mind, which could include wrong-site surgery, right-left error, wrong patient error, or other near miss.

Identification of Local System Errors

A total of 26.7% of residents work in clinical settings where all lesions sampled for biopsy are photographed and recorded to assist with locating those that need reexcision, 6.4% in settings where photographs of all lesions considered suspicious (suggestive of cancer) are included in the electronic medical record, and 16.5% in settings where photographs of some but not all suspicious lesions are included in the record; 29.4% work in dermatology programs that never incorporate clinical photographs of biopsy-sampled lesions in the medical record.

Residents variably perform a purposeful pause (“time-out”) to confirm patient, procedure, and site before biopsy; 20.0% of respondents reported doing so “always,” 25.2% “usually,” 22.7% “sometimes,” 19.1% “rarely,” and 15.7% “never.” In addition, residents variably read back the patient name and site before biopsy; 20.0% of respondents reported doing so “always,” 25.2% “usually,” 21.7% “sometimes,” 19.1% “rarely,” and 17.2% “never.”

Table. Resident Personal Errors, Systems Errors, and Poor Patient Safety Role Modeling

<table>
<thead>
<tr>
<th>Errors and Poor Role Modeling</th>
<th>Residents, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Errors committed by residents</strong></td>
<td></td>
</tr>
<tr>
<td>Needle-stick injury with failure to report</td>
<td>28 (45.2)</td>
</tr>
<tr>
<td>Right-left mislabeling mistake</td>
<td>118 (96.7)</td>
</tr>
<tr>
<td>Cutting and pasting patient information from previous note</td>
<td>77 (82.8)</td>
</tr>
<tr>
<td>“Near-miss” patient safety issue</td>
<td>98 (89.9)</td>
</tr>
<tr>
<td><strong>System errors identified by residents</strong></td>
<td></td>
</tr>
<tr>
<td>Processes reliant on an individual's remembering to do or ask something</td>
<td>97 (98.0)</td>
</tr>
<tr>
<td>Clinical photographs of lesions sampled for biopsy</td>
<td>77 (70.6)</td>
</tr>
<tr>
<td>Photographs of all sampled lesions, included in EMR</td>
<td>29 (26.6)</td>
</tr>
<tr>
<td>Photographs of all suspicious lesions, included in EMR</td>
<td>7 (6.4)</td>
</tr>
<tr>
<td>Photographs of some but not all suspicious lesions, included in EMR</td>
<td>18 (16.5)</td>
</tr>
<tr>
<td>Photographs of suspicious lesions, not included in EMR</td>
<td>23 (21.1)</td>
</tr>
<tr>
<td>Performing “time-out” before biopsy</td>
<td>97 (84.3)</td>
</tr>
<tr>
<td>Always</td>
<td>23 (20.0)</td>
</tr>
<tr>
<td>Usually</td>
<td>29 (25.2)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>23 (20.0)</td>
</tr>
<tr>
<td>Rarely</td>
<td>22 (19.1)</td>
</tr>
<tr>
<td>Reading back patient name and site before placing biopsy specimen in container</td>
<td>68 (61.8)</td>
</tr>
<tr>
<td>Always</td>
<td>7 (6.4)</td>
</tr>
<tr>
<td>Usually</td>
<td>21 (19.1)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>25 (22.7)</td>
</tr>
<tr>
<td>Rarely</td>
<td>15 (13.6)</td>
</tr>
<tr>
<td>Poor role modeling identified by residents</td>
<td></td>
</tr>
<tr>
<td>Resident worked with ≥1 intimidating attending physician</td>
<td>63 (50.0)</td>
</tr>
<tr>
<td>Resident failed to speak out when errors were witnessed because of working with intimidating attending physician</td>
<td>71 (59.7)</td>
</tr>
<tr>
<td>Resident witnessed attending physician disregarding required safety steps</td>
<td>72 (78.3)</td>
</tr>
</tbody>
</table>

Abbreviation: EMR, electronic medical record.

* A total of 142 residents responded.
site listed on the specimen container before placing the specimen in the container (6.4% of respondents reported doing so always, 19.1% usually, 22.7% sometimes, 13.6% rarely, and 38.2% never).

Nearly all residents (98.0%) could think of examples in their dermatology practice environment where processes that could be automated or triggered by reminder systems are based on an individual team member having to remember to act or ask for information.

Residents Identify Poor Patient Safety Role Modeling
Half of the residents (50.0%) reported working with at least 1 attending physician during residency whom they considered “disruptive,” defined as intimidating those around him or her. Similarly, 59.7% of residents reported working with at least 1 attending physician during residency to whom they did not speak up when identifying something about that physician’s care that may not have been correct or safe. Finally, 78.3% of residents reported having witnessed an attending physician purposefully ignore or disregard required safety steps (eg, failing to wear gloves when exposed to blood, wear safety glasses during surgical or laser procedures, or handle sharp objects properly).

Discussion
The data from this study demonstrate that dermatology residents are committing, failing to report, and quietly witnessing patient safety errors in the dermatology residency training environment. They also experience injuries caused by sharp objects in the clinical environment and fail to report these lapses in universal precautions at an alarming rate. Although we did not investigate why residents failed to disclose injuries, other studies have found that dermatology residents may not report injuries considered “minor” or occurring in familiar patients in whom there was low suspicion of communicable diseases (eg, human immunodeficiency virus infection), may consider reporting processes inconvenient, or may fear the stigma associated with receiving a needle stick.3,5

Errors can also be propagated by the majority of residents who report cutting and pasting patient information into the medical record without confirming its accuracy. In a 2003 study that reviewed 60 patient charts, 20% had evidence of copying and 60% had information errors.6 This habit is facilitated by an electronic environment that allows quick cutting and pasting of medical record information. This routine is most likely formed in medical school when busy medical students mimic the practices of even busier residents as they scramble to compose multiple admission histories and physical examination reports. Consequently, a culture of efficiency is emphasized, at the cost of safety and accuracy.

Clarke et al7 evaluated 427 reports of wrong-site Mohs surgery and found that systems problems, such as incomplete office records, were the root cause of error in most cases. They also discovered that preprocedure site confirmation and documented time-out failed to prevent 45 wrong-site surgical procedures.7 Site identification by the physician and the patient during dermatologic surgery has also proved to be a challenge. In a 2006 survey of Mohs surgeons, 14% of malpractice cases were the result of wrong-site surgery.8

Almost every resident has experienced a right-left mislabeling of a body part and a near miss during training. Outside the field of dermatology, most studies of wrong-site surgery involve laterality mistakes (eg, operating on the wrong arm or leg). In dermatology, however, surgical sites can be more complex when an explicit site within a cosmetic unit or body region is involved. To define a biopsy site, a lesion on the ear can be recorded as “ear” or by a more specific anatomic term (eg, superior helix, cymba, or tragus).9 Similarly, when a patient has numerous previous procedures in a body region (eg, extensor forearm or right forehead), it can be difficult to distinguish a well-healed biopsy site from a previous treatment site. Between January 2004 and June 2011, more than 5000 sentinel events had been reported to the Joint Commission, 13.6% of which were wrong-site surgical procedures, making this the most common event reported.10

Several steps can be implemented to reduce the rates of right-left mislabeling and wrong-site surgical procedures in dermatology. Although preprocedure site confirmation and formal time-outs are helpful and recommended, there is evidence that these steps alone may be insufficient to prevent up to one-third of wrong-site surgical procedures in dermatology, especially in cases of multiple lesions and inaccurate location descriptions on pathology forms or preoperative referral notes.11 In a survey of Mohs surgeons, 89% believed that a photograph was the most useful modality for identifying biopsy sites.9 Almost one-third of residents in our study were training in a program where clinical photographs of biopsy-sampled lesions are not incorporated into practice. Of residents in programs that do include a photograph, only 26.6% include a photograph of every lesion sampled for biopsy, with some reserving photographs for lesions considered suspicious. It is unknown how often cancer is diagnosed after biopsy of lesions by residents without a pretest suspicion for cancer. We suggest documenting biopsy sites accurately in the medical record (eg, with a photograph), performing a brief confirmatory time-out before each dermatologic procedure, and reading back the specimen label, including patient name and site location, before the specimen is placed in the container.

Behaviors of attending physicians probably contribute to the safety culture in residency as well. Our data confirm that 78.3% of dermatology residents witnessed an attending physician disregard required safety steps during dermatologic procedures, such as wearing goggles, masks, and gloves. It is difficult to expect graduating residents to practice a culture of safety if programs do not effectively role model these desired behaviors. Many residents who identify safety lapses are too intimidated to speak up when attending physicians are not practicing safe methods. This is not unique to dermatology residents. In a 2006 survey of 650 resident members of the American Medical Association, 25% reported having experienced nonphysical harm from attending physicians, and 50% felt uncomfortable reporting intimidation.12

Our study had some limitations. We surveyed a limited sample of dermatology residents attending a medical derma-
Patient safety is a growing component of ACGME residency requirements. The ACGME expects all residents to “participate in identifying system errors and implementing potential systems solutions.” In particular, the ACGME has instituted the Clinical Learning Environment Review program, which emphasizes the responsibility of the sponsoring institution for the quality and safety of the environment for learning and patient care and assesses sponsoring institutions in 6 areas, including patient safety. Under this program, institutions are expected to provide “opportunities for residents to report errors, unsafe conditions, and near misses, and to participate in inter-professional teams to promote and enhance safe care.” Potential examples to help residents comply with the Clinical Learning Environment Review program include faculty-directed morbidity and mortality dermatology conferences, in which faculty and residents explore where errors occurred, or institutional processes for residents to anonymously report patient safety issues.

Despite these requirements, our results indicate that there are significant patient safety practice gaps in dermatology residency training. Although personal accountability is important, so is the recognition that errors in many cases are related to the systems in place that allow such errors to occur. Most new dermatology residents are thrust into unfamiliar, possibly antiquated health care delivery systems and asked to work within their confines, with little means of altering them. The behaviors, attitudes, teaching styles, and practices of attending physicians also contribute significantly to the local safety culture during residency. We suggest monitoring by both the institution and program director for signs of an intimidating teaching environment, with targeted faculty development when necessary.

### Box. Patient Safety Recommendations for Dermatology Residency Programs

- **Orientation and yearly discussion of required safety steps for all attending physicians, residents, and medical assistants**
- **Orientation and yearly discussion of institutional safety steps taken after accidental exposure to blood or body fluid exposure (ie, explain incident reporting process)**
- **Preprocedure documented identification of all biopsy or operative sites, regardless of initial clinical impression (eg, with a photograph)**
- **Confirmatory “read back” of biopsy specimen container label, including patient name and site location, before placement of specimen in container**
- **Faculty-directed morbidity and mortality dermatology conferences, in which faculty and residents explore where errors occurred**
- **Institution and program director monitoring for signs of an intimidating teaching environment, with targeted faculty development when necessary**

The process of change begins with awareness, followed by open discussion about the local relevance of these safety issues, then plans for action to narrow practice gaps (Box). Our data reinforce the need to modify systems to reduce injuries and improve communication between physicians. Foremost among the needed modifications is the creation of an environment free of intimidation that allows a resident to question or point out any safety concern to attending physicians.

### Conclusions

Our data reinforce the need for formation of modified systems to improve communication with patients and between the members of the health care team who care for them. Processes to reduce patient and physician injuries and to create an intimidation-free environment are also important to establish.

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- **Acquisition of data:** Stratman.
- **Analysis and interpretation of data:** All authors.
- **Drafting of the manuscript:** All authors.
- **Critical revision of the manuscript for important intellectual content:** Stratman.
- **Obtained funding:** Stratman.
- **Administrative, technical, or material support:** Swary.
- **Study supervision:** Stratman.

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**REFERENCES**


Scurvy Aboard Ferdinand Magellan’s Voyage of Circumnavigation

Leonard J. Hoenig, MD; Walter H. C. Burgdorf, MD

One of the greatest feats of exploration was Ferdinand Magellan’s voyage of circumnavigation (1519-1522). The story of this Spanish expedition was chronicled by Antonio Pigafetta, who traveled with Magellan and kept a diary.

Pigafetta’s most harrowing account concerns their crossing of the Pacific Ocean, during which Magellan’s crew endured a deadly encounter with scurvy. Scurvy is a disease caused by vitamin C deficiency that would plague sailors for the next 3 centuries. This nightmare began on November 28, 1520, after Magellan (1480-1521) and his crew successfully completed their crossing of the treacherous Straits of Magellan and entered the Pacific Ocean. This accomplishment fulfilled Magellan’s dream, first envisioned 500 years ago, of finding a westward maritime route from Europe that would lead to the Spice Islands of Indonesia.

Concerning the Pacific crossing, Pigafetta writes: “We had been three months and twenty days without taking refreshment of any kind.” Magellan’s crew had exhausted their food stores and were forced to subsist on rotten biscuits and yellow, putrefied water. In desperation the men ate anything: cowhides, sawdust, and even rats. Amidst starvation conditions, rotten biscuits and yellow, putrefied water. In desperation the men ate any-

Pigafetta’s most striking clinical observation was gingival hypertrophy, a feature of scurvy in which defective collagen synthesis leads to the loss of support for blood vessel walls. The gums, therefore become red, swollen, friable, and hemorrhagic. The gingival abnormalities occur only in the presence of teeth. Other dermatologic features of scurvy include follicular hyperkeratosis associated with corkscrew hairs, perifollicular hemorrhage, petechiae, ecchymosis, and poor wound healing.

On March 6, 1521, Magellan’s expedition reached Guam and procured fresh foods that enabled the crew to recover from their illness. Unfortunately, Magellan was later killed in a battle in the Philippines. On September 8, 1522, the last ship of Magellan’s original fleet of 5 vessels docked in Spain, completing the voyage around the world. On board were 18 survivors of the expedition’s original 266 men. Most had perished in the Pacific travels.

With the adoption of James Lind’s 1753 landmark dietary recommendations for the prevention and treatment of scurvy, epidemics of the disease on the high seas subsided. Scurvy, however, can still be clinically seen in populations at risk for malnutrition, such as elderly individuals, indigent persons, and alcoholics. The vitamin properties of ascorbic acid (vitamin C) were codiscovered by Albert Szent-Györgyi and Charles Glen King between 1928 and 1932. Szent-Györgyi was later awarded the 1937 Nobel Prize in Physiology or Medicine.

Magellan’s voyage of circumnavigation was a monumental achievement and test of human endurance. It also illustrated our frailty and how fatal it could be for anyone to lack even a single vitamin. Today, mankind looks toward the heavens for further space exploration. At the same time we realize that our lives are so inextricably bound with the Earth, a planet whose surface was first circumnavigated nearly 500 years ago.

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