The Forgotten Tourniquet—An Update

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A tourniquet was inadvertently left on the patient's arm after phlebotomy, and the patient subsequently developed deep vein thrombosis in that arm.

*The patient had a regional anesthesia block prior to surgery on the arm. The patient was discharged a day later and returned to the hospital complaining of pain and numbness of the fingers. A tourniquet was found under the operative bandages. Once the tourniquet was removed, the patient's symptoms improved.**

INTRODUCTION

Challenges persist in ensuring the removal of tourniquets after procedures such as peripheral intravenous (IV) insertion, phlebotomy, and extremity surgery. The Pennsylvania Patient Safety Authority addressed this topic in *Pennsylvania Patient Safety Advisory* articles published in June 2005 and September 2010.[1,2] Pennsylvania facilities continue to report these events through the Authority's Pennsylvania Patient Safety Reporting System (PA-PSRS), with varying degrees of harm to patients. With healthcare's adoption of high-reliability strategies and safety behaviors (e.g., paying attention to detail) including patient-engagement initiatives, new techniques can be employed to help avoid such events.

METHODS

Analysts queried the PA-PSRS database for events occurring between January 1, 2012, and December 31, 2014, that contained the keyword and derivations of "tourniquet" reported under the following event types:

- Equipment, supplies, or devices
- Error related to a procedure, treatment, or test
- Complication of a procedure, treatment, or test
- Transfusion
- Skin integrity
- Other and miscellaneous

From this group of event types, the terms "IV," "IV start," "phlebotomy," and "blood draw" were used to analyze these reports. The three-year time frame was chosen to ensure an adequate sample size. Prolonged intraoperative tourniquet time and tourniquets intentionally left on the patient (e.g., temporary vascular control) were excluded from the sample.

A report was classified as an IV insertion in instances in which the narrative mentioned both IV insertion and phlebotomy as the precursor event or when tourniquets were left on after accessing dialysis catheters.

Events without enough detail to distinguish between IV insertion and phlebotomy were classified as "phlebotomy" (inferred) if, in the report, the event subtype "laboratory test problem" was selected, and as "IV start" (inferred) if the event subtype "IV site complication (phlebitis, bruising, infiltration)" or "extravasation of drug or radiologic contrast" was selected, regardless of the care area selected.

* The details of the PA-PSRS event narratives in this article have been modified to preserve confidentiality.

RESULTS

Classification

The query identified 1,448 events; review of report details determined that 369 were not applicable to IV insertion, phlebotomy, or surgical procedures, leaving 1,079 reports for further analysis (Figure 1).

Patient Age

The majority of patients, 61.8% (n = 667), were age 65 years or older; 35.6% (n = 384) were age 19 to 64; and 2.6% (n = 28) were age 0 to 18.

Duration

The duration of the tourniquet application was identified in 19.3% (n = 208) of the 1,079 events (Figure 2). The longest duration reported was 24 hours.

Harm

The majority of events, 99.5% (n = 1,074), were classified as Incidents and 0.5% (n = 5) as Serious Events. Of the five Serious Events, 80% (n = 4) were related to IV insertion or phlebotomy and 20% (n = 1) was related to regional anesthesia. Patient harm as described in the Serious Event narratives included limb paresthesia, weakness, pain, swelling, and deep vein thrombosis.

Event Discovery

Event reports indicate that the majority of events, 77.6% (n = 837) of the 1,079, were discovered by staff. The remaining 22.4% (n=242) events were accounted for as follows:

- Unidentified 10.6% (n = 114)
- Patient or family 10.1% (n = 109)
- Physician 1.5% (n = 16)
- Other (e.g., another facility) 0.3% (n = 3)

Contributing Factors

Contributing factors were mentioned in 9.5% (n = 103) of the 1,079 event narratives and are not mutually exclusive (Figure 3). Analysts grouped like factors as follows:

- Environment-related (e.g., tourniquets found under gowns, drapes, blood pressure cuffs, restraints)
- Personnel-related (e.g., tourniquets applied by a clinician other than nurses or phlebotomists, such as physicians, IV team, students, orientees, contractors, multiple team members; and factors affecting performance such as distraction)
- Patient-related (e.g., limb paralysis, neuropathy, unconsciousness, dementia, conditions requiring dialysis, non-English speaking, nonverbal)

Figure 1. Tourniquet Events by Procedure Classification Reported to the Pennsylvania Patient Safety Authority, January 2012 through December 2014 (N = 1,079)

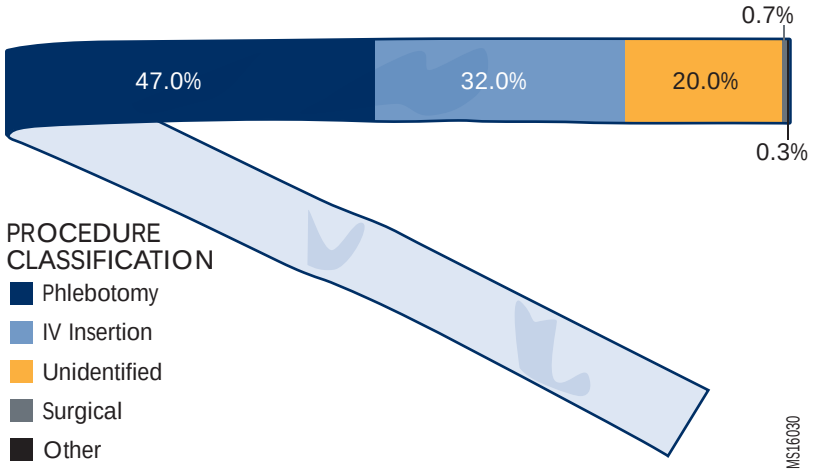


Figure 2. Tourniquet Duration Identified in Event Narratives Reported to the Pennsylvania Patient Safety Authority, January 2012 through December 2014 (N = 208)

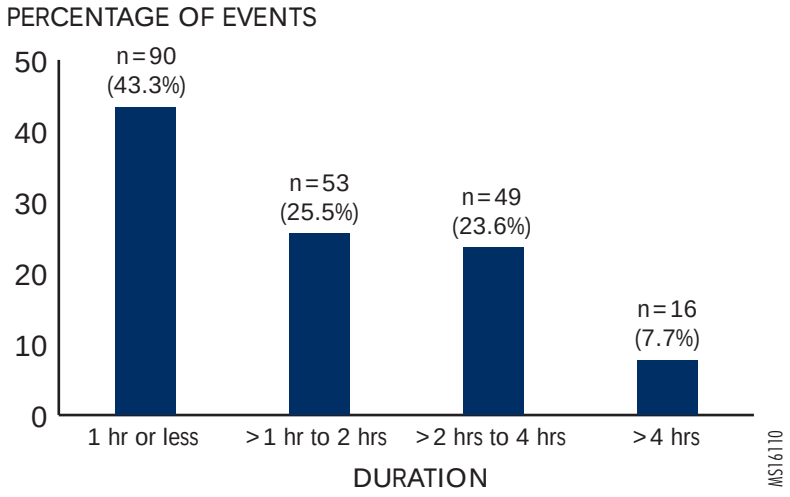
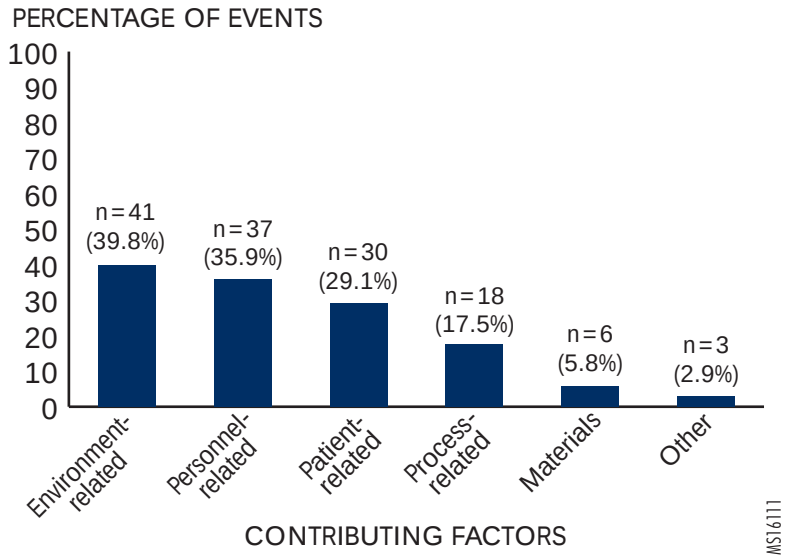


Figure 3. Contributing Factors Indicated within Tourniquet Event Narratives as Reported to the Pennsylvania Patient Safety Authority, January 2012 through December 2014 (N = 103)



***Note:* Data are not mutually exclusive.**

- Process-related (e.g., using an alternative site such as the foot, ankle, or wrist)
- Materials-related (e.g., using an alternative material as a tourniquet such as a glove or blood pressure cuff)

DISCUSSION

Healthcare personnel are responsible for removing the tourniquet after IV insertion, phlebotomy, and anesthesia blocks are complete. Challenges persist in ensuring tourniquet removal and patients have experienced varying degrees of harm as a result.

Understanding the characteristics of forgotten tourniquets can be used as a risk assessment strategy for preventing forgotten tourniquet events.

RISK REDUCTION STRATEGIES

The Veterans Health Administration provides a list of recommendations intended to reduce the incidence of tourniquet-related events, including standardizing blood draw schedules, minimizing distractions, using checklists, and establishing processes to ensure the tourniquet is released.[3] The Infusion Nurses Society suggests two strategies:

1. Promote "an awareness campaign and have care settings be held accountable by tracking outcomes" as part of a quality improvement initiative and
2. Establish a "competency validation process" for staff that includes direct observation.[4]

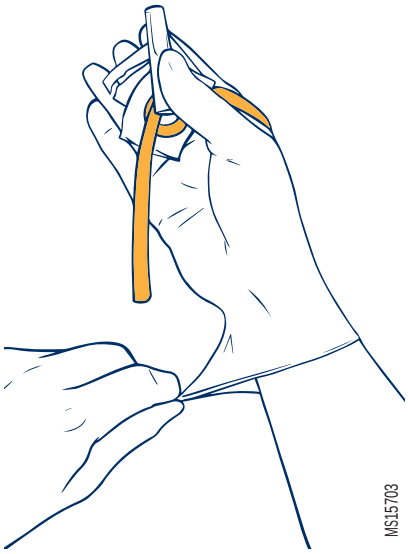
Terry Baldridge, PBT(ASCP), phlebotomy supervisor at Nazareth Hospital in Philadelphia, stresses the importance of "paying attention to tourniquet time" (i.e., the duration of time the tourniquet remains tightened on the extremity), because time of more than 60 seconds affects laboratory results.[5,6] Attending to tourniquet time *may* be more important than the successful IV insertion or phlebotomy and may help staff remember to remove the tourniquet. A staff phlebotomist at a free-standing laboratory agreed that in her practice the "most important thing" is to remove the tourniquet before 60 seconds regardless of outcome, thus ensuring the tourniquet is removed.[7]

Baldrige identified an additional key step in the phlebotomy procedure process that can be adapted to the IV insertion process: establish a standard location and disposal process for the phlebotomy equipment and debris. A process could be as follows: staff will remove the tourniquet as soon as blood starts to flow and upon completion of the procedure; hold the needle cap, alcohol wipe, and tourniquet in the gloved hand; pull the glove down over the debris and discard all of these components together.[5] (See Figure 4 for an illustration of the process, or view a step-by-step video online with this article.) The needle or sheathed needle is discarded in a sharps container. At this point a final visual verification is made to ensure that the tourniquet has been removed. Baldrige performs random direct observations on staff to ensure ongoing competency with the phlebotomy procedure.[5]

Safety Behaviors

Paying attention to detail when performing a task can lead to a successful

Figure 4. Appropriate Discard Process



outcome. The safety behavior technique: stop, think, act, review (STAR) is designed to assist staff to do just that.[8] Jennersville Regional Hospital, in West Grove, Pennsylvania, uses STAR to help reduce the incidence of tourniquets being left on patients after IV insertion and phlebotomy. According to Karen Stark, RN, BSN, director of risk management and patient safety officer, Jennersville practices high reliability and safety management through a collection of safety strategies: *support the team*, *ask questions*, *focus on the task*, and *communicate effectively*.[9]

In support of the *focus on the task* strategy, the STAR safety behavior is taught and practiced by all staff, and Stark said, "STAR is going through your head before you perform the task. You *stop*, almost like a time out, you *think* of the entire process ahead of time, *act* to perform the phlebotomy or IV start, and then *review* the task and process – do I have all of my materials?"[8]

Patient Engagement

Engaging patients in their care and treatment can lead to better outcomes.[10] The PA-PSRS events showed two factors related to patient engagement:

- Patients may not always be aware that a tourniquet has been left on or they may assume that it was left in place intentionally.
- Patients and family members who discovered the tourniquet notified or questioned staff.

Some patients and families could be involved in IV insertion and phlebotomy procedures. Staff could inform the patient or family member that the tourniquet placement is temporary and as a safety measure, involve them in the removal step. Staff may encourage the patient and family member to always ask questions, not just when something seems incorrect. According to Christine Foore, MS, CPHQ, director of patient experience at Wellspan York Hospital, in York, Pennsylvania, "It's not about remembering to take the tourniquet off, it's about the culture; how do we engage patients in their care to make them feel free to speak up in the first place?"[11]

CONCLUSION

Previously published strategies to reduce the incidence of tourniquet-related events remain applicable today.[3] Since the Authority first reported on tourniquet events and prevention strategies in 2005 and 2010, Pennsylvania hospitals continue to report events in which a tourniquet is left on a patient after procedures such as IV insertion, phlebotomy, and extremity surgery.

Forgotten tourniquet events reported through the Authority's PA-PSRS from 2012 through 2014 are more likely to happen to elderly patients, occur after phlebotomy, and involve sites hidden by a gown sleeve, drape, or blood pressure cuff. Forgotten tourniquets generally have not caused harm to the patient, have been left in place for an hour or less, and have been discovered by staff. Facilities may find this information helpful when developing their own risk assessment and mitigation strategies to prevent forgotten tourniquet events.

NOTES

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