PA PSRS
Pennsylvania Patient Safety Reporting System

Patient Safety Advisory

Produced by ECRI & ISMP under contract to the Pennsylvania Patient Safety Authority

Forgotten But Not Gone: Tourniquets Left on Patients

Since the implementation of PA-PSRS a year ago, Pennsylvania healthcare facilities have submitted more than 125 reports of tourniquets being left on patients' extremities.

While few of the reports submitted to PA-PSRS were considered Serious Events, this problem has the potential to cause significant circulatory, neurological, vascular, and muscular damage. Certain laboratory test results, such as complete blood counts or potassium levels, may be altered if a blood specimen is drawn from an extremity on which a tourniquet is placed for a prolonged period.[1] Inappropriate care/treatment of the patient may be the consequence.

The longer a tourniquet is left in place, the greater the chance of significant injury. In only 5% of the reports submitted to PA-PSRS was the tourniquet discovered within a half hour of application. Two-thirds were left on patients for up to two hours. The remaining third were left in place from two to 18 hours.

Many of the reports indicate that the cause of the error was related to failure to follow procedures or individual clinicians' proficiency. However, multiple reports were submitted by more than 60 hospitals, suggesting that this is a systemic problem that could benefit from system-wide solutions.

How Does It Happen?
In approximately half of the reports, the tourniquet was being used in conjunction with starting an IV line, while in the other half it was used for drawing a blood specimen for laboratory tests.

Of the 36 reports that identified any contributing factors, 61% cite staff failure to follow procedures, 42% cite staff proficiency, and 31% cite distractions and interruptions (see Figure 1). Other contributing factors cited in the reports included: inexperienced staff, communication problems between providers, change of service, cross-coverage situation, lack of patient compliance, and lack of patient understanding.

The majority of facilities' recommendations for improvement involved individual counseling, discussion, or education, and referral to the department perceived as causing the occurrence. At least 17% of reports indicated that no system improvement issues were identified.

Seven reports indicated an Eindhoven Causal Code, six of which involved human behavior: external, coordination, intervention, and rules based-monitoring. One report indicated a Causal Code of patient-related factor. Another report cited patient observation procedures as a root cause according to the Joint Commission Root Cause Analysis (RCA) taxonomy.

Despite this focus on the individual, environmental and task-related factors contributed to many of these occurrences. Several reports indicated that the presence of the tourniquet was hidden. For example, a tan-colored tourniquet may blend in with light skin tones, making it difficult to see. In ORs/Special Procedure areas, a surgical drape may cover an extremity in which an IV was started and a tourniquet was inadvertently left in place. In a critical care area, a tourniquet was discovered under an automatic blood pressure cuff. In a morbidly obese patient, a tourniquet may sink into fatty tissue/skin folds and may not be visible once applied. In a few cases, IVs appeared to run well even though the tourniquet had not been released, suggesting that successful infusion is not an indication that all is well.

Harm
While 98% of these reports were submitted as Incidents (indicating no harm), 48% of these Incidents did indicate a symptom related to prolonged tourniquet use. The predominant symptoms documented were redness and indentation at the tourniquet site.

Other symptoms documented were: pain or discomfort; extremity edema; extremity temperature change; extremity color change (pale, blue, gray, purple, dusky); numbness/tingling/burning sensation; skin tears; IV infiltrations; and delayed capillary refill.

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Two reports were categorized as Serious Events. In one case, the harm was IV infiltration. In the other, the patient was transferred to a higher level of care for evaluation after a tourniquet was left on for 18 hours. Fortunately, compartment syndrome and thrombosis were ultimately ruled out.

Interventions
Interventions in response to the assessment involved: monitoring the extremity; notifying the physician; examination by the physician; notifying other departments viewed as causing the occurrence (ED, Lab, IV team); and notifying the patient's family.

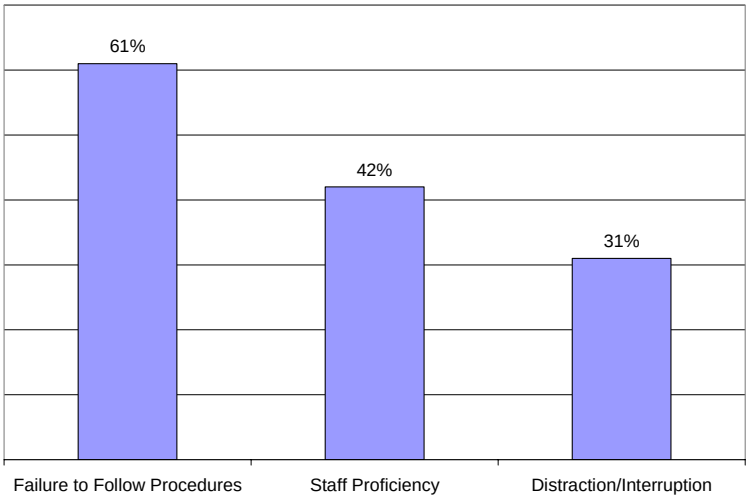

Figure 1. Factors Cited in Reports of Forgotten Tourniquets. Among those reports citing any contributing factors, the percentage of reports citing these factors is shown. The most commonly cited factors suggest a narrow focus on the individual healthcare worker, rather than a broader focus on more systematic solutions.

The following types of patient care were reported: movement of the extremity, application of warm compresses or ice, and elevating the extremity. Skin integrity-related interventions involved consultation with the wound care team, application of skin cream, and application of occlusive dressing. In one case a venous Doppler study was documented as ordered. In another, the patient was transferred to a higher level of care for evaluation.

Who Leaves/Discovers Tourniquets
Of the 28% of the reports that indicated the category of healthcare worker who left the tourniquet in place, a variety of personnel are described including nurses, student nurses, laboratory technicians/phlebotomists, nursing assistants, anesthesiologists, IV teams, and blood teams. Only one report documented that the person who applied the tourniquet discovered it in place thereafter. Myriad personnel discovered tourniquets left in place by others.

In 19% of these reports, the tourniquet was discovered after the patient was transferred to another department for care. While more than half of these occurrences originated on medical/surgical units (30%), Emergency Departments (14%), and inpatient/ambulatory surgical services departments (14%), few departments were immune to this risk. Occurrences were also reported from numerous other units and settings. In addition, at least three patients arrived from other facilities with tourniquets in place.

Patients at the extremes of age may be particularly vulnerable to this type of error, possibly due to inability to recognize or communicate the problem to healthcare workers. Sixty percent of patients involved in these cases were 70 years of age or older, and several were less than two years old. Only 5% of the reports indicated that a patient/family member identified the presence of the tourniquet. Some reports indicated that the patient's condition may have caused the patient to be unaware of/unable to feel the tourniquet (i.e., the patient was asleep/anesthetized or had a cognitive or neurological impairment). Patients may be unable to communicate verbally the presence of a tourniquet (e.g., infants, patients with expressive aphasia or advanced dementia). If other equipment or supplies mask the tourniquet, the patient may be unaware of its presence. Some patients may think that the tourniquet is left on for a therapeutic purpose.

Risk Reduction Strategies
While most reports focused upon the individual healthcare worker/department perceived as causing the occurrence, at least one Pennsylvania facility recognized that color might contribute to tourniquets being left on patients. In an effort to make their tourniquets more visible, the facility changed the color of its tourniquets from tan to royal blue, increasing their visual contrast with all skin tones.

Root Cause Analysis teams within the Veterans Administration identified the following strategies in a recent review[2] of over 90 occurrences of tourniquets being left behind:

- Loosening tourniquets during any interruption in the blood draw process, when blood begins to

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flow into a vacuum tube or after the IV catheter is advanced, or before needle withdrawal.
- Documenting procedures only after completing them (including tourniquet removal).
- Double-checking that a tourniquet has been removed prior to leaving a patient's room and documenting the procedure completion.
- Having two healthcare workers sign the IV flow sheet to verify tourniquet removal after IV insertion.
- Controlling/reconciling the number of tourniquets used via checklists. Having a second healthcare worker verify that the number of tourniquets and IV kits used are equal/accounted for.
- When entering and leaving a unit, the phlebotomist reconciling a list of patients for venipunctures with the number of tourniquets in the venipuncture tray.
- For ambulatory patients, considering a separate location on the unit for specimen/blood draws. This may reduce distractions or interruptions.
- Standardizing blood draw/IV start schedules across departments so they do not coincide with periods of increased activity.
- Using consistent, proficient personnel to perform blood draws.
- Heightening awareness of healthcare workers to the problem and consequences of leaving a tourniquet on too long.
- Rolling up gown sleeves (rather than pushing sleeves up) to enhance tourniquet visibility. Placing the tourniquet over a sleeve may also promote visibility and enhance patient comfort by preventing pinching and tears of friable skin.
- Raising the bed height to view the patient's extremity fully.
- If blood flow does not stop quickly, checking for tourniquet placement.
- When clinically appropriate, limiting blood draws or IV starts until experienced IV team/phlebotomy staff are available.

Other strategies to consider include:

- Heightening awareness that a tourniquet may still be in place, even if an IV is running well.
- Using long tourniquets so the ends of applied tourniquets are more visible.
- Being aware of patient nonverbal cues. Patient agitation/fussiness may be a symptom of discomfort associated with prolonged tourniquet use.
- Routinely incorporating into patient assessments an evaluation for the presence of tourniquets (even in verbal, oriented patients).
- Involving the patient/family in the care by instructing/developing a brochure[3,4] concerning phlebotomy/IV starts including:
  - The concept that a tourniquet is usually left on for a few minutes.
  - To tell healthcare workers if a tourniquet remains on for a longer period.
  - That laboratory test results may be altered if a specimen is drawn from an extremity on which a tourniquet is applied for longer than 2-3 minutes.

One Pennsylvania facility recognized that tourniquets' color might contribute to their being left on patients. The facility changed its tourniquets from tan to royal blue, increasing the visual contrast with all skin tones.

A combination of strategies going across healthcare disciplines and departments, as well as patient involvement, may help to address the systems-related issues involved with forgotten tourniquets.

Notes

1. ECRI. Leaving tourniquets on too long may have severe consequences. *Health Devices Alerts*. Accession Number S0072 [online]. 2005 May 6 [cited 2005 May 10].

2. Samples C. When tourniquets are left behind. *TIPS Topics in Patient Safety*. VA National Center for Patient Safety. 2005 Mar/Apr;5(2):2-3.

3. How can I decrease my discomfort when getting a blood sample drawn. MMSupport.net [online]. [cited 2005 May 10]. Available from Internet: http://web.mmsupport.net/content/view/17/25/.

4. Greenwich Hospital. Patient information sheet. Intravenous catheter [online] 2004 Aug [2005 May 17]. Available from Internet: http://www.greenhosp.org/greenwich/pe_pdf/iv_catheter.pdf

An Independent Agency of the Commonwealth of Pennsylvania

The Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error ("Mcare") Act. Consistent with Act 13, ECRI, as contractor for the PA-PSRS program, is issuing this newsletter to advise medical facilities of immediate changes that can be instituted to reduce serious events and incidents. For more information about the PA-PSRS program or the Patient Safety Authority, see the Authority's website at www.psa.state.pa.us.

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