

Under-Reporting of a Critical Perioperative Adverse Event: Intravenous Infiltration and Extravasation

This article was published in the following Dove Press journal:
Drug, Healthcare and Patient Safety

George Tewfik 

Department of Anesthesiology, Rutgers-
New Jersey Medical School, Newark, NJ
07103, USA

Abstract: A critical step in understanding and preventing potentially disastrous complications in the perioperative period is the accurate recording of their occurrence and subsequent analysis. However, the recording of intravenous infiltration and extravasation is likely inaccurate due to several factors: rare serious complications associated with infiltration/extravasation, limitation in ICD-10 codes to describe the injury, reliance on coders to record these events in searchable databases, and limited quality measures in anesthesiology to record these events. Although current literature cites results of studies that found rates of 16% and higher for intravenous infiltration, a limited internal review at University Hospital in Newark, NJ found significantly lower rates with only 14 instances recorded in an 18-month period across the institution. This leads the author to conclude that interventions are required to better track these events including such steps as staff education and more efficient/accessible reporting systems. The accurate recording and analyzing of data related to adverse events, and in particular regarding infiltration and extravasation, require revision and reinterpretation to gain an accurate picture of their rates.

Keywords: infiltration, extravasation, complication rates

To the Editor

Intravenous infiltration, the leak of IV-administered material into surrounding tissue, and extravasation, the leak of vesicant, are potentially catastrophic complications of venous cannulation that may result in tissue necrosis and damage requiring emergent treatment. Vesicant agents may cause severe vasoconstriction leading to ischemia and necrosis, depolarization and contraction of smooth muscle sphincters leading to tissue injury, and compartment syndrome because of exertion of osmotic pressure.¹ However, because extravasation and infiltration often cause only minor self-healing complications,^{2,3} their true complication rates are likely severely under-reported.

At University Hospital in Newark, NJ, we underwent an 18-month retrospective analysis of all hospital records, and located only 14 reported instances of infiltration and extravasation. Three of the fourteen patients were newborns, and a total of 6 of the 14 patients were 18 years of age or younger. Infiltration/extravasation has long been understood as one of the most common unintentional adverse events occurring to newborns admitted to the NICU, and although reporting rates vary widely, studies have shown as high as a 70% rate of infiltration in newborns.⁴

Correspondence: George Tewfik
Department of Anesthesiology, Rutgers-
New Jersey Medical School, 185 South
Orange Ave, Newark, NJ 07103, USA
Tel +1 973 972-5007
Email gt31@njms.rutgers.edu

Although we have had several instances of IV infiltration recorded in the Anesthesia Dept. for internal review in the same timeframe, these statistics were not recorded by the hospital, which is able to track only ICD-10 codes to track these complications. ICD-10 codes are severely limited in scope. Extravasations are coded under T80.81 for “Extravasation of vesicant agent” or T80.818 for “Extravasation of other vesicant agent”. Non-vesicant, IV infiltrations are often coded as T80.89 for “Other complications following infusion, transfusion and therapeutic injection” or T80.90 for “Unspecified complication following infusion, transfusion and therapeutic injection”.

In institutions, such as University Hospital in Newark, diagnosis codes for hospitalizations are done by coders in Medical Records, who review physician notes to input these codes. Limitations in tracking rates of infiltration and extravasation can be attributed to the difficulty in performing an accurate retrospective data analysis from these limited diagnosis codes.

In addition, extravasation and infiltration are not included in standard adverse event monitoring reports, such as the AQI NACOR QCDR or MIPS measures. This makes it more difficult to track complications related to intravenous catheters internally within anesthesia departments. Often, internal quality input systems allow users to record infiltrations and extravasations as “Other” complications, and allow free text to describe this issue. However, this makes the complication not searchable in statistical analysis, preventing the user from accessing a true picture of the complication rate.

Intravenous infiltrations and extravasations can be especially damaging when they occur during anesthetics due to the potential high volume that may be infused before the complication is detected. This can occur because anesthesia providers do not have a clear line of sight to all infusing catheters, such as when extremities are tucked, patient position is variable, or the lines have been placed in a distant location. Large infusions via these misplaced catheters require treatment ranging from observation, elevation and warm compresses to surgical interventions such as fasciotomies.

Infiltration and extravasation range in rates of incidence as reported in literature. Recently, Simin et al⁵ reported a rate of infiltration of 16% after observations of 1428 intravenous catheters and Marsh et al⁶ reported a rate of 32% for catheter failure (which included infiltration) after observing 1578 IVs. These rates far exceed the negligible incidences found in our home institution.

It is also hypothesized that intravenous infiltration may be under-reported due to a low rate of long-term

or serious adverse complications as a result of this complicating event. A recent study by Gibian et al⁷ reviewed 495 infiltration events and found that 8.6% resulted in a soft tissue infection, 3.2% experienced necrosis and 1.9% suffered ulceration. The authors further found that only 5.1% of these patients were deemed to suffer from long-term defects secondary to the infiltration.

Given the reported rates of infiltration in literature, it is impossible to accept that a Level I trauma center such as University Hospital that records 100,000 emergency room visits annually would encounter only 14 cases of infiltration in an 18-month period. A critical step in understanding and preventing these potentially disastrous complications is the accurate recording of their occurrence and subsequent analysis.

Current systems of recording and analyzing data regarding infiltration and extravasation require revision and reinterpretation to gain an accurate picture of their rates. Institutional reporting and the reliance on coding systems may not be adequate to track these complications. Improved education of physicians, nurses and other healthcare professionals will likely be necessary along with simple and easily accessible reporting and tracking systems to ensure proper diagnosis and management of intravenous infiltration and extravasation.

Disclosure

G Tewfik has no conflicts of interest.

References

- Schummer W, Schummer C, Bayer O, Muller A, Bredle D, Karzai W. Extravasation injury in the perioperative setting. *Anesth Analg*. 2005;100:722–727. doi:10.1213/01.ANE.0000154442.30278.3C
- Bellin MF, Jakobsen JA, Tomassin I, et al. Contrast medium extravasation injury: guidelines for prevention and management. *Eur Radiol*. 2002;12(11):2807–2812. doi:10.1007/s00330-002-1630-9
- McManus J, Lund C, Nonato L. Neonatal integumentary system. In: *Ross Pediatric Clinical Education Series*. 2002. Ross Products Division.
- Sangam S. Quality improvement measures for early detection of severe intravenous infiltration in infants. *BMJ Open Qual*. 2019;8:e000407. doi:10.1136/bmjocq-2018-000407
- Simin D, Milutinović D, Turkulov V, Brkić S. Incidence, severity and risk factors of peripheral intravenous cannula-induced complications: an observational prospective study. *J Clin Nurs*. 2019;28(9–10):1585–1599. doi:10.1111/jocn.14760.
- Marsh N, Webster J, Larson E, Cooke M, Mihala G, Rickard CM. Observational study of peripheral intravenous catheter outcomes in adult hospitalized patients: a multivariable analysis of peripheral intravenous catheter failure. *J Hosp Med*. 2018;13(2):83–89. doi:10.12788/jhm.2867
- Gibian JT, Zakria D, March C, Schaheen B, Drolet BC. Outcomes and management of peripheral intravenous infiltration injuries. *Hand (N Y)*. 2020;28:1558944720906494. doi:10.1177/1558944720906494.

Drug, Healthcare and Patient Safety

Dovepress

Publish your work in this journal

Drug, Healthcare and Patient Safety is an international, peer-reviewed open-access journal exploring patient safety issues in the healthcare continuum from diagnostic and screening interventions through to treatment, drug therapy and surgery. The journal is characterized by the rapid reporting of reviews, original research, clinical, epidemiological and post-marketing surveillance studies, risk management, health

literacy and educational programs across all areas of healthcare delivery. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/drug-healthcare-and-patient-safety-journal>