Evaluation of the protocol for intra-muscular needle-stick injuries: Does blood at the injection site predict blood on the needle?

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Research aim

The objective of this study was to determine how often blood is observed on the needle or injection site after intra-muscular (i.m.) injections and to assess the diagnostic accuracy of blood at the injection site as a predictor for blood on the needle.

Background

- In the Netherlands, 15,000 needle-stick injury's (NSIs) occur every year with possible transmission of hepatitis B, hepatitis C and HIV.
- According to the Dutch national guidelines, intra-muscular (i.m.) NSIs are categorized as high or low-risk, based on the observation of blood on the needle or at the injection site, as proxy for blood on the needle (see figure 1).
  - If blood is obverved, NSIs are classified as high-risk and preventive measrues against hepatitis B, hepatitis C, and HIV are needed. For example, testing, vaccinating or the use of post-exposure prophylaxis (PEP).
  - If blood is not observed, NSIs are classified as low-risk and only preventive measures against hepatitis B are necessary.
- Classifying blood at the injection site as high-risk may overestimate the number of NSIs with blood on the needle, resulting in possible overtreatment.

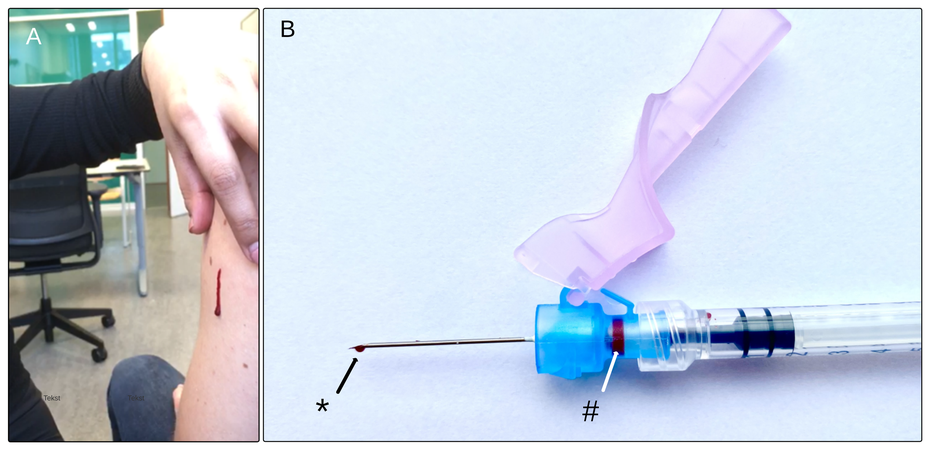

Figure 1. Example of blood on the needle and blood at the injection site after an intra-muscular injection.
Figure A. Demonstrates an example of blood at the injection site.
Figure B. Demonstrates example of blood on the needle.
*blood on the needle, #blood in the syringe of the needle

Methods

- I.m. injections were observed at the Public Health Service of Amsterdam during the COVID-19 vaccination campaign, at the Travel Health Clinic and at the Center for Sexual Health Amsterdam, between February 2021 and January 2023.
- Client and injection relevant data, as well as the presence of blood on the needle and injection site, were registered.

Results

- We observed a total of 616 i.m. injections.
- Blood on the needle was observed after 25/616 (4.1%) i.m. injections and blood at the injection site was observed after 439/616 (71.3%) injections (see figure 2).

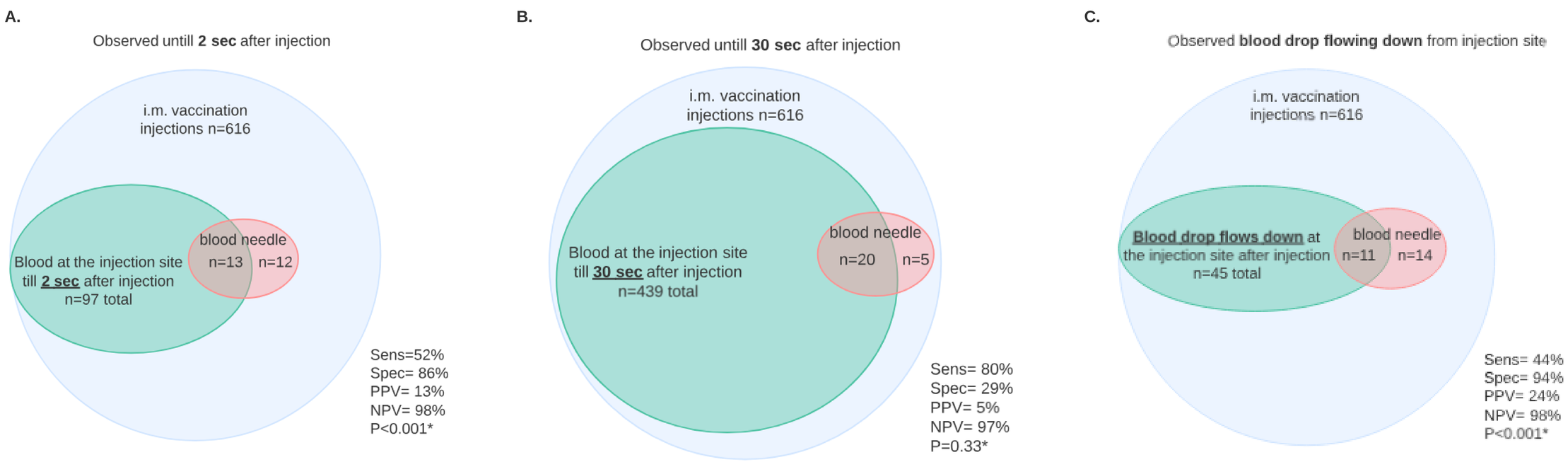

Figure 2. **Association between blood on the needle and at the injection site, after intra-muscular vaccinations**. *Figure 1A-B* Venn diagram of vaccinations demonstrating the relation between blood on the needle and blood at the injection site, after 2 and 30 sec of observation after injection, respectively. *Figure 1C* Venn diagram demonstrating the relation between blood on the needle and a blood drop flowing down from the injection site. Abbreviations: I.M.= intra-muscular, Sens= sensitivity, Spec= specificity, PPV= positive predictive value, NPV= negative predictive value, sec= seconds. *P-values are based on the Pearson two-sided chi-square test or Fisher exact test for categorical variables.

- Post-test-probability for blood on the needle was 4.6% when blood was observed at the injection site (see figure 3A), compared to 2.8% in the absence of blood at the injection site (see figure 3B).

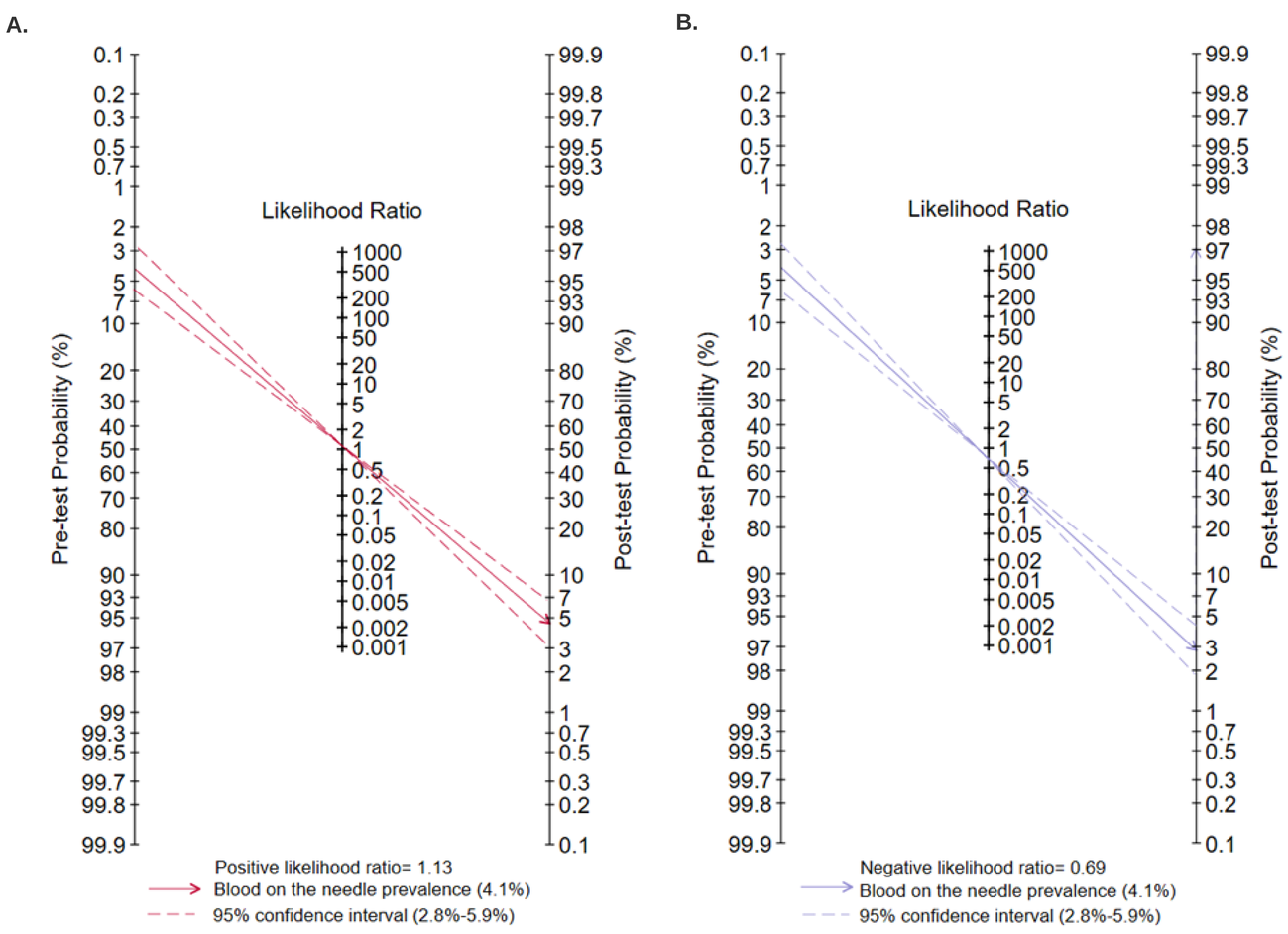

Figure 3. **Fagan's nomogram for blood at the injection site as a predictor for blood on the needle.**
Figure 3A. Fagan's nomogram in the presence of blood at the injection site after injection when observed for 30 seconds after injection. Figure 3B. Fagan's nomogram in the absence of blood at the injection site after injection when observed for 30 seconds after injection.

Conclusions

- Blood on the needle was seen in 4% of i.m. injections and blood at the injection site in 71% of the injections.
- The specificity for blood at the injection site as proxy for blood at the needle decreased with increasing observation time, resulting in possible over-classification of high-risk events.
- Therefore, the presence of blood at the injection site as an indicator for blood on the needle when distinguishing between high and low-risk i.m. NSIs needs to be re-evaluated.

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