Factors contributing to first time insertion success of peripheral intravenous cannula inserted in the emergency department.

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Introduction:
Vascular access is indispensable in the emergency department (ED) for patients who require it. It enables clinicians perform diagnostic (blood sampling and monitoring) and interventional practice (intravenous therapy). In our ED nursing and medicine share the insertion of peripheral intravenous cannulae (PIVC). Successful first time PIVC insertion depends on a variety of factors such as; clinical presentation, body mass, skin shade, a visible and/or palpable vein, number of cannulation sites, vein measurement, rationale for insertion, and inserter confidence among others. Our aim was to identify the first time PIVC insertion success rate and factors that contribute to successful insertion.

Methods:
We conducted a survey of ED PIVC insertion and included pre and post insertion questions. This was registered and approved by a human research ethics committee. Summary statistics, frequencies and descriptive plots were our initial analysis. Univariate and multivariate binary logistic regression were then conducted to investigate the relationship between the aforementioned factors and first time insertion success. Receiver operating characteristics (ROC) were performed and the area under the curve calculated.

Results:
A total of n=734 PIVC insertions were recorded. First time insertion success was 86%. The anatomical region most frequently cannulated was the antecubital fossa (50%). The clinical rationale and reason for PIVC insertion was ambiguous with 42% of PIVCs inserted for possible intravenous therapy, compared to only 38% for definitive intravenous therapy. Multivariate logistic regression modelling of patient measures found patient size, visible and palpable veins, as well as site of insertion to be of statistical significance. Clinician measures that were statistically significant included the clinician's number of cannulation procedures performed and the clinician's likelihood to successfully insert a PIVC. ROC curves for three models were calculated. The areas under the curve for the model containing all measures, patient only measures and clinician only measures were 0.85, 0.79 and 0.82 respectively.

Discussion and Conclusion:
PIVCs are medical devices ubiquitous in the ED. Studies have shown they have an unacceptable level of failure. Repeated insertion attempts are highly unpleasant for patients and an avoidable cost for healthcare institutions. From our results we are now modelling a pre-insertion screening tool for our ED that may identify patients who need extra interventions to increase first time insertion success, and reduce failure for admitted patients.