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Evaluation of use and identification of predictive factors for nonuse of peripheral venous catheters in the emergency department

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Abstract

The placement of peripheral venous catheters (PVC) is a frequent procedure in the emergency department (ED), which exposes patients to complications (hematoma, fluid leakage, phlebitis, edema, infection), increases hemolysis of blood samples, is time-consuming and costly. The main aim of this study is to analyze the rate of PVC nonuse in the ED and to identify predictive factors of their nonuse. This prospective single-center observational study was conducted in the ED of the Saint-Antoine Hospital in Paris, France between February and March 2022. Adult patients receiving a PVC were included. In addition to demographic and medical data, the reason for PVC prescription and the prescribing physician's expectation of PVC use were collected. A total of 304 patients were included, with a median age of 61.5 years (IQR: 43–79 years), of whom 152 (50%) were men. PVC were primarily prescribed for intravenous medication administration. Seventy-two (23.7%) PVC were not used. In multivariable analysis, the predictive factors of nonuse were the prescribing physician's expectation of nonuse [OR 6.35, CI 95% (2.64–15.29), for "no" and "not sure" vs. "yes" responses] and the reason for prescribing "just in case" [OR 3.54, CI 95% (1.37–9.17)]. PVC were not used in 23.7% of cases. Predictors of nonuse were the prescribing physician's expectation of nonuse and the reason for prescribing "just in case". A PVC should probably not be prescribed if the prescribing physician thinks it will not be used or prescribes it "just in case".

Keywords Peripheral venous catheterization · Use · Relevance · Organization · Emergency department

Introduction

Peripheral venous catheters (PVC) are frequently placed in hospital settings, around 25 million every year in France [1]. The "just in case" prescription of PVC has existed for years in emergency departments (ED) [2] and was justified by the need to improve patient safety, a recurrent problem being the need for emergency venous access once the patient is hospitalized. In addition, it may be of interest to insert a PVC during blood sampling, to facilitate a later intravenous (IV) drug administration or a remote blood sample. However, between 33.8 and 60.7% of PVC inserted in the ED are not used [3–7]. Moreover, Mailhe et al. showed that 60.5% of patients hospitalized from the ED had their PVC removed within 24 h [8]. The placement of a PVC is time consuming for the nursing staff and uncomfortable for patients. Couteaux et al. showed that vascular punctures (in particular venous punctures) are the leading cause of pain in hospitalized patients [9]. PVC insertion exposes patients to several adverse events: hematomas, fluid leakages, phlebitis,

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edemas and infections [10]. Finally, blood samples obtained from PVCs are more often hemolyzed than those obtained by direct venipuncture [11]. To the best of our knowledge, studies on PVC use have been limited to a used or not used dichotomy, without investigation of possible predictive factors for non-use. In addition, few studies have explored the appropriateness of PVC prescription in the ED. The primary objective of this study was to analyze the rate of PVC nonuse in ED. The secondary objectives were to identify predictive factors of PVC nonuse and to assess the appropriateness of their prescription.

Methods

Design and population

A prospective, single-center, observational study was conducted in an urban university hospital ED (Saint-Antoine Hospital, Assistance Publique-Hôpitaux de Paris, Sorbonne Université), between February 14 and March 4, 2022. All patients over 18 years old presenting to the ED from Monday to Friday between 8 am and 6 pm and receiving a PVC were eligible. This convenience sample was decided to allow the inclusion of as many eligible patients as possible, with the presence during these hours of a coordinating physician who ensured that each eligible patient was included, and considering that it is more difficult to include patients in studies during night and weekend shifts. In addition, meetings about the study were organized with medical and nursing staff and multiple posters were displayed during the study period.

Outcomes

The primary endpoint was the nonuse of PVC during the ED stay. A PVC was considered used if the patient received IV therapy (including drug, fluid, or contrast agent) or if a blood sample was remotely collected. The secondary endpoint was the appropriateness of PVC prescription. The relevance of prescriptions was assessed a posteriori by three independent physicians (each working in a different ED), by reading the initial part of the medical report (including information collected from the patient's admission to the PVC prescription, censored for evolution and conclusion). They were also blinded to the reason for prescribing and expectation of use. A prescription was considered relevant if at least two of the three assessors considered it as such.

Data collection

Data collected included: demographic data (age, sex), vital parameters (systolic blood pressure, heart rate, respiratory rate, oxygen saturation, oxygen requirement, Glasgow Coma Scale (GCS), temperature, hyperthermia defined as a temperature ≥ 38 °C, capillary blood glucose, numerical pain scale (NPS), intense pain defined as a NPS ≥ 7), triage score according to the French Emergency Nurses Classification in Hospital triage (FRENCH) [12], ED area (resuscitation unit or conventional pathway), chief complaint (cardiology, dermatology, gastroenterology, urology/obstetrics and gynecology, neurology, ear nose and throat/ophthalmology, psychiatry, respiratory, rheumatology, traumatology, environmental/general/intoxication), prescribing physician status (consultant or resident), use of PVC during ED stay (as defined above), orientation (discharge or hospitalization).

The physician prescribing the PVC prospectively included the patient by specifying all the reasons for prescribing ("just in case", IV drug, IV filling/hydration, imaging with IV contrast agent, remote blood sample) and his or her expectation of PVC use (answering the question "Do you expect this PVC to be used during the patient's stay in the ED?" on a five-point Likert scale: 1 "no, not at all", 2 "no, probably not", 3 "uncertain", 4 "yes, probably" or 5 "yes, most certainly"). The rest of the data was collected via the medical report.

Ethical considerations

As this study involves the reuse of routinely collected data, it falls within the scope of the MR-004 reference methodology of the French legislation. The study protocol was approved by the Sorbonne University research ethics committee and registered in the Assistance Publique-Hôpitaux de Paris studies registry (number 20211215100450). Patients were given an information leaflet and their verbal nonopposition was recorded. The participating physicians were informed about the study and agreed to have their prescription data analyzed. The study is reported according to the STROBE statement for reporting observational studies [13].

Statistical analysis

Assuming that 10 events per variable is an advocated minimal criterion for sample size considerations in logistic regression analysis and that a maximum of 10 variables would be associated with PVC nonuse, the number of events needed for a proper multivariate analysis was 100. Based on a nonuse rate of 33.3% (or 66.7%) [3–7] in line with the literature, the needed number of subjects was 300. Some 20 catheters are inserted every day between 8 am and 6 pm in our emergency department [14], so the planned duration of the study was 3 weeks.

Qualitative variables are expressed as numbers and percentages, quantitative variables as medians and interquartile ranges. For tests, the triage scores were grouped according to their degree of emergency: triage 1–2 and triage 3B–4–5.

The reasons for prescribing and use of PVC during ED stay were classified into therapeutic procedure (IV drug and IV filling/hydration) and complementary examination (imaging with contrast agent and remote blood sample). The physician's expectation of PVC use was divided into two categories, 1–2–3 (no or uncertain) and 4–5 (yes).

Comparisons of categorical variables were performed by χ^2 or Fisher exact tests (depending on χ^2 validity) and those of quantitative variables were performed by the Wilcoxon–Mann–Whitney test. A receiver operating characteristic (ROC) curve of the physician's expectation of use was performed. Variables included in a logistic multivariable model were selected by a stepwise selection process on Akaike information criterion in both directions. Included variables in the selection process were factors significant in univariate analysis and selected on their clinical relevance. The odds ratios and their 95% confidence intervals were obtained by the logistic regression. All tests were two-tailed with a significance threshold reached when $p < 0.05$. Missing data were not imputed. Statistical analysis were performed with R software (version 4.1.0).

Results

A total of 304 patients were included in the study and analyzed. Characteristics of the participants are presented in Table 1. Of these, 152 (50%) were men, with a median age at 61.5 (43–79) years. A large majority of triage ranged from 2 to 3B ($n = 281$, 92.4%). The main chief complaints were gastroenterological ($n = 65$, 21.4%) and cardiologic ($n = 61$, 20.1%). The characteristics related to the prescription of PVC are presented in Table 2. The majority of prescriptions were motivated by the administration of IV medication ($n = 175$, 57.8%) while 70 (23.1%) were prescribed "just in case". Most prescribing physicians expected their PVC to be used with certainty ($n = 160$, 53%). Seventy-two (23.7%) PVC were not used. PVC were mainly used for IV drug administration ($n = 196$, 64.5%). As shown in Table S1 (supplemental material), the majority of treatments were analgesics (67.9%). Regarding the execution rates of the reasons for prescribing: 87.7% of the PVC prescribed for an IV medication were used for this reason, whereas this was the case for only 40.7% of those prescribed for a remote drawing of blood sample.

Comparison of patient characteristics according to whether PVC was used or not revealed several significant differences in univariate analysis (Tables 1, 2). Comparing to the group "PVC used", patients in the group "PVC not used" were triaged as less urgent ($p = 0.001$), had a lower respiratory rate (16/min vs. 18/min, $p = 0.006$), were less often oxygen-dependent (5.6 vs. 15.5%, $p = 0.03$), had less intense pain (8.3 vs. 26.7%, $p < 0.001$) and were less often hospitalized (26.4 vs. 55.6%, $p < 0.001$). Two-thirds of patients consulting for psychiatric reasons had their PVC unused, whereas 90.8% of those consulting for gastroenterological reasons had their PVC used. The reasons for prescribing differed significantly between the two groups ($p < 0.001$), with a majority of PVC prescribed "just in case" in the "PVC not used" group (61.1 vs. 11.3% in the "PVC used" group). The PVC of most patients predicted not to be used were indeed not used (80 and 75.9% for expectations 1 and 2, respectively). The PVC were used in 90.5% of the cases where the prescriber had planned it (expectations 4 and 5) and in 45.7% of the cases where it was uncertain (expectation 3). The ROC curve of the physician's expectation of use showed an area under the curve of 0.85, with an optimal threshold of 3.5 giving a sensitivity of 87.4% and a specificity of 70.8% (Fig. 1). When comparing expectations rated 1 to 3 against those rated 4 to 5, we find a positive predictive value (PPV) of 63.8% and a negative predictive value (NPV) of 90.5%.

The variables selected for the multivariable logistic regression model, were: expectation of PVC use, reason for prescribing, respiratory rate and intense pain. The multivariate logistic regression model revealed the impact of the prescribing physician's expectation of PVC use [OR = 6.35 (2.64–15.29), $p < 0.001$] and the reason for prescribing "just in case" [OR = 3.54 (1.37–9.17), $p = 0.009$] on PVC nonuse (Fig. 2). The other variables had no significant impact.

Analysis of the medical reports by the 3 assessors showed that 87.5% of the PVC prescriptions seemed appropriate (Table 3). This ratio ranged from 73 to 87.5% depending on the evaluator. Inter-rater agreement was fair with a Fleiss kappa of 0.38. The justified-used agreement (i.e., the rate of PVC prescriptions judged to be justified in which PVC was used) was 79.3%, when compared with 44.7% for the unjustified-not used agreement.

Discussion

The rate of PVC nonuse (23.7%) is lower than what is found in the literature (between 33.8 and 60.7%) [3–6]. This can be explained by the prospective nature of the study and the involvement of the prescribing physician (who had to justify his reason for prescribing) which are probably responsible for a Hawthorne effect. Furthermore, practices in the department may have been influenced by a recent intervention aimed at reducing the prescription of intravenous infusions [14]. Moreover, patients' characteristics might differ between our convenience sample and patients consulting at night or during weekends. Finally, among the studies assessing the appropriateness of PVC prescription, the lowest nonuse rates (33.8 and 43%) are found in French studies [6, 7],

Table 1 Characteristics of patients receiving peripheral venous catheters

	Total ($n=304$)	PVC not used ($n=72$)	PVC used ($n=232$)	p
Demographics				
Age (years)	61.5 (43–79)	66 (49.5–77.5)	60 (42–79)	0.31
Sex (male)	152 (50)	32 (21.1)	120 (78.9)	0.28
Vital parameters				
Systolic blood pressure (mmHg)	134 (117.5–151.5)	129.5 (118.5–146.5)	136 (117–153)	0.29
Heart rate (/min)	83 (72–99.2)	78.5 (72–91.2)	84.5 (72–102)	0.053
Respiratory rate (/min)	17 (15–20)	16 (14.5–18.5)	18 (15–22)	**0.006**
Oxygen saturation in room air[a] (%)	97 (96–99)	98 (96–99)	97 (96–99)	0.08
Oxygen requirement[a]	40 (13.2)	4 (5.6)	36 (15.5)	**0.03**
Glasgow Coma Scale (GCS)	15 (15–15)	15 (15–15)	15 (15–15)	0.63
GCS < 15	10 (3.3)	3 (4.2)	7 (3)	0.71
Temperature (°C)	36.6 (36.2–36.9)	36.6 (36.1–36.8)	36.6 (36.1–36.8)	0.25
Hyperthermia (T ≥ 38.0)	19 (6.3)	2 (2.8)	17 (7.3)	0.26
Capillary blood glucose[c] (mmol/L)	6.6 (5.5–8.4)	6.8 (5.5–8.7)	6.6 (5.6–8.4)	0.84
Numerical pain scale (NPS)[b]	2 (0–6)	0 (0–4)	3 (0–7)	**0.002**
Intense pain[b] (NPS ≥ 7)	68 (22.4)	6 (8.3)	62 (26.7)	**<0.001**
Triage score				–
1	6 (2)	1 (1.4)	5 (2.2)	
2	110 (36.2)	14 (19.4)	96 (41.4)	
3A	80 (26.3)	21 (29.2)	59 (25.4)	
3B	91 (29.9)	28 (38.9)	63 (27.2)	
4	17 (5.6)	8 (11.1)	9 (3.9)	
5	0 (0)	0 (0)	0 (0)	
Triage score (grouped)				**0.001**
1–2	116 (38.2)	15 (20.8)	101 (43.5)	
3A	80 (26.3)	21 (29.2)	59 (25.4)	
3B–4–5	108 (35.5)	36 (50)	72 (31)	
ED area				0.13
Resuscitation unit	80 (26.3)	14 (19.4)	66 (28.4)	
Medical	224 (73.7)	58 (80.6)	166 (71.6)	
Chief complaint				**0.006***
Cardiology	61 (20.1)	20 (27.8)	41 (17.7)	
Dermatology	5 (1.6)	2 (2.8)	3 (1.3)	
Gastroenterology	65 (21.4)	6 (8.3)	59 (25.4)	
Urology/obstetrics and gynecology	25 (8.2)	3 (4.2)	22 (9.5)	
Neurology	42 (13.8)	13 (18.1)	29 (12.5)	
Ear nose and throat/ophthalmology	0 (0)	0 (0)	0 (0)	
Psychiatry	6 (2)	4 (5.6)	2 (0.9)	
Respiratory	39 (12.8)	7 (9.7)	32 (13.8)	
Rheumatology	7 (2.3)	2 (2.8)	5 (2.2)	
Traumatology	18 (5.9)	4 (5.6)	14 (6)	
Environmental/General/Intoxication	36 (11.8)	11 (15.3)	25 (10.8)	
Physician status				0.16
Consultant	110 (36.2)	31 (43.1)	79 (34.1)	
Resident	194 (63.8)	41 (56.9)	153 (65.9)	
Orientation				**<0.001**
Discharged	156 (51.3)	53 (73.6)	103 (44.4)	
Hospitalized	148 (48.7)	19 (26.4)	129 (55.6)	

p-value in bold indicates $p < 0.05$

Data are reported as median (Q1–Q3) or n (%)

PVC peripheral venous catheter, *Q1Q3* first and third quartile

[a]10 missing data

[b]7 missing data

Table 1 (continued)

[c]103 missing data

*After grouping: rheumatology with traumatology; dermatology with ear nose and throat/ophthalmology, psychiatry and environmental/general/intoxication

Table 2 Characteristics of peripheral venous catheter prescriptions

	Total ($n=304$)	PVC not used ($n=72$)	PVC used ($n=232$)	p
Reason for prescription[a,c]				–
Just in case	70 (23.1)	44 (61.1)	26 (11.3)	
IV medication	175 (57.8)	18 (25)	157 (68)	
IV filling/hydration	58 (19.1)	9 (12.5)	49 (21.2)	
Imaging with contrast agent	64 (21.1)	11 (15.3)	53 (22.9)	
Remote blood sample	54 (17.8)	9 (12.5)	45 (19.5)	
Reason for prescription[a] (grouped)				**<0.001**
Just in case	70 (23.1)	44 (61.1)	26 (11.3)	
IV therapeutic[d]	133 (43.9)	12 (16.7)	121 (52.4)	
Complementary examination[e]	41 (13.5)	7 (9.7)	34 (14.7)	
IV therapeutic and complementary examination	59 (19.5)	9 (12.5)	50 (21.6)	
Expectation of use[b]				–
1 = No, not at all	5 (1.7)	4 (5.6)	1 (0.4)	
2 = No, probably not	29 (9.6)	22 (30.6)	7 (3)	
3 = Uncertain	46 (15.2)	25 (34.7)	21 (9.1)	
4 = Yes, probably	62 (20.5)	13 (18.1)	49 (21.3)	
5 = Yes, most certainly	160 (53)	8 (11.1)	152 (66.1)	
Expectation of use[b] (grouped)				**<0.001**
1–2–3	80 (26.5)	51 (70.8)	29 (12.6)	
4–5	222 (73.5)	21 (29.2)	201 (87.4)	
End use[c]				–
Not used	72 (23.7)	72 (100)	0	
IV medication	196 (64.5)	0	196 (84.5)	
IV filling/hydration	47 (15.5)	0	47 (21.0)	
Imaging with contrast agent	65 (21.4)	0	65 (29.0)	
Remote blood sample	37 (12.2)	0	37 (16.5)	
Other	0	0	0 (0)	
End use (grouped)				–
Not used	72 (23.7)	72 (100)	0	
IV therapeutic[d]	139 (45.7)	0	139 (59.9)	
Further examination[e]	28 (9.2)	0	28 (12.1)	
IV therapeutic and further examination	65 (21.4)	0	65 (28)	

p-value in bold indicates $p < 0.05$

Data are reported as median (Q1–Q3) or n (%)

IV intravenous, *PVC* peripheral venous catheter, *Q1Q3* first and third quartile

[a]1 missing data

[b]2 missing data

[c]Total > 100% because of multiple responses

[d]Intravenous medication/filling/hydration

[e]Imaging with contrast agent or remote blood sample

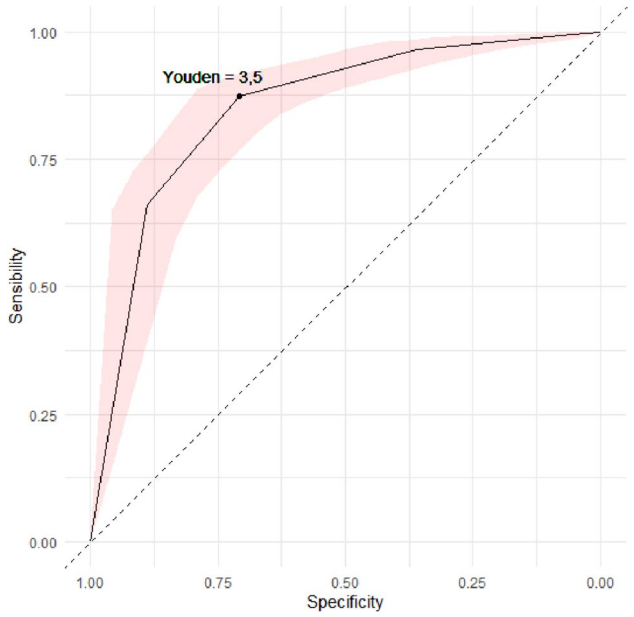

Fig. 1 ROC curve of prescribing physician's expectation of peripheral venous catheter use

which could reflect the fact that French practices result in lower rates of PVC nonuse as compared to other countries.

The rate of PVC nonuse decreased when triage score increased, which is in agreement with data in the literature. Indeed, the FRENCH classification has been shown to effectively classify patients according to their severity, defined by hospitalization rate and prescription of additional examinations [15]. The results were similar for patient outcome, with fewer hospitalizations in the "PVC not used" group. The use of vital parameters as predictive factors is tricky: in univariate analysis, only the most extreme parameters were associated with a PVC nonuse, such as intense pain and oxygen requirement. The lack of significance of some outcomes such as hyperthermia and heart rate could be explained by a lack of power. However, these differences, even if statistically significant, do not appear to be clinically relevant for identifying patients at risk of PVC nonuse.

A gastroenterological chief complaint was associated with the use of PVC, which can be explained by the high proportion of patients requiring rapid analgesic treatment (often IV) or imaging with contrast agent, unable to receive oral treatment because of vomiting or needing to be fasting in the event of a surgery. On the other hand, the PVC in patients consulting for psychiatric reasons were rarely used, as they are often routinely inserted during a blood test requested by the psychiatrist. These results differ from those found in the literature, where the chief complaints associated with PVC nonuse were orthopedic, cardiologic and hematological according to Craigie et al. [4], neurological, obstetrics and gynecology according to Limm et al. [3]. These contradictory results do not allow us to conclude that there is a real association between the chief complaint and the use of PVC.

Table 3 Analysis of prescription appropriateness of prescribing peripheral venous catheters

	Justified prescriptions	Justified-used agreement (%)	Not justified-not used agreement (%)
Evaluator #1	266 (87.5)	80	50
Evaluator #2	222 (73)	85.6	48.8
Evaluator #3	264 (86.8)	77.7	33.3
Majority	266 (87.5)	79.3	44.7

Data are reported as *n* (%) or %

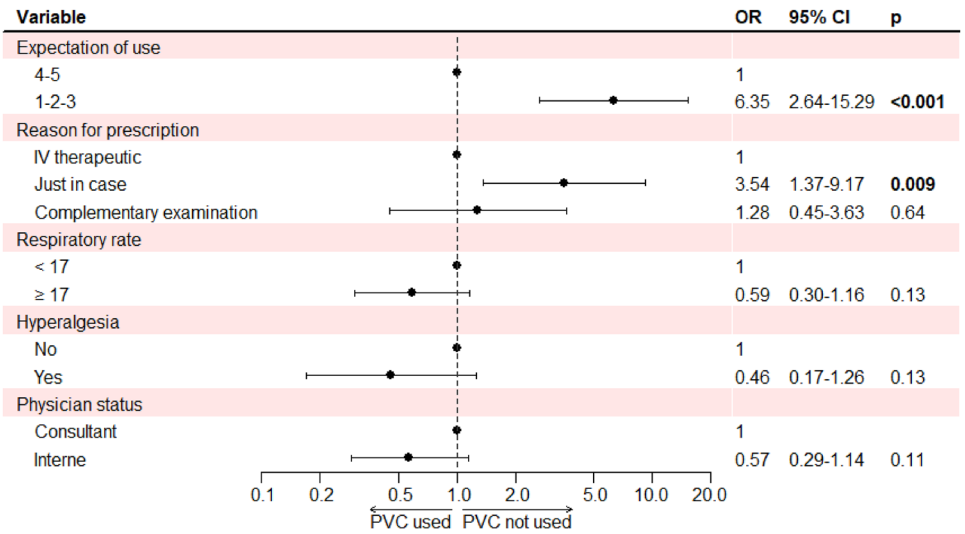

Fig. 2 Forest plot of explanatory variables for peripheral venous catheter non-use

Most of the prescriptions were for IV medication and a large proportion were filled. This can be explained by the concomitant prescription of the PVC and the IV medication, most of the prescribed medication being analgesics prescribed during the initial management of the patient. The "just in case" was the second most popular reason and was significantly associated with PVC nonuse. This raises the question of the relevance of PVC prescription without having a specific plan for use. In the study by Craigie et al. [4], 80% of PVC insertions were performed in the triage area according to the judgment of the nurse, without immediate use, consistent with a "just in case" reason. The rate of PVC nonuse was then 60% when decided by nurses, when compared with only 5% when prescribed by physicians. The authors emphasize that the judgment leading to the indication of PVC placement is biased because it focuses only on the potential advantages (time saving, venous access available if needed) and ignores the risks inherent to PVC placement (phlebitis, hematoma, infection, hemolysis). The expected time savings must be balanced with the time required to place and then remove a PVC when the patient is discharged from the ED. It is also important to consider the economic and ecological implications of consuming equipment that will not be used. The rate of PVC use for remote blood sample is lower than for other reasons. This can be explained by the nature of the need for remote blood sample, generally to monitor the evolution of an abnormal blood marker, which implies anticipating the first results. The decision to place a PVC for biological monitoring then depends entirely on the physician's judgment according to the initial assessment of the patient.

Prescribers have a good predictive ability regarding PVC use. Since the Youden index is located for an expectation value of 3.5 (i.e., between 3 "uncertain" and 4 "yes, probably"), we can deduce a prescribing rule implying that if the prescriber does not think PVC will be used, then it is better not to prescribe it. However, the predictive ability of the prescriber is good primarily for predicting PVC use rather than nonuse. Indeed, although the NPV of nonuse is excellent (90.5%), the PPV is only 63.8%. The advantage of this prescribing rule is that it is extremely simple to implement in clinical practice. To our knowledge, this is the first study to consider the prescribing physician's expectation of PVC use. This type of assessment by the physician is comparable to the "gestalt", the physician's clinical acumen which has shown its superiority in comparison with the Wells and Geneva scores for the diagnosis of pulmonary embolism [16]. This shows that clinical acumen makes for relevant decisions.

The rate of PVC prescriptions considered justified by the evaluators (87.5%) was higher than the rate of PVC actually used (76.3%) and the inter-rater agreement was fair. This highlights the uncertainty regarding the possible use of certain PVC and the complexity of judging the relevance of prescription from the medical records, as previously shown in a study assessing unjustified intravenous infusions [14]. Unfortunately, there is no validated tool for assessing prescribing appropriateness. An alternative method, more complicated to implement, would have been to obtain a consensus for each case after discussion within a group of experts.

The IV medication prescriptions were comparable to those found by Guilhard et al. [7], with a majority of analgesics. It is worth considering whether it is necessary to prescribe those drugs intravenously, especially when there is an oral alternative. A meta-analysis that evaluated the pharmacokinetic and clinical impact of oral vs. IV paracetamol in a perioperative setting reports that bioavailability is better for the IV form, but the clinical impact is not obvious, with studies showing conflicting results regarding the pain intensity and the use of morphine [17]. In a context closer to our current practice in the ED, Furyk et al. [18] found no significant difference in pain reduction between oral and IV paracetamol use among patients presenting to the ED with moderate to severe pain. These two studies allow us to assume that the need for IV paracetamol is questionable in the ED. Unfortunately, existing literature has not yet compared the efficacy of oral vs. IV forms for other analgesics commonly used in the ED.

Limitations

This study has several limitations. First, this is a single-center study, which limits the generalization of the results. Second, the choice of a convenience sample may induce a sampling bias. Third, despite all the precautions taken, it is possible that some eligible patients were not included. Fourth, there may have been a Hawthorne effect underestimating the proportion of unused PVC. Fifth, missing data were not imputed; however, missing data was minimal (for all variables except for capillary blood glucose) and should not have affected the results. Finally, the rate of PVC nonuse was lower than expected (likely partially due to the Hawthorne effect), which resulted in a lack of statistical power and a limited number of variables which could be included in the multivariate model.

The use of a larger cohort of patients could allow for the identification of other predictive factors of PVC nonuse. Finally, it would be interesting to document the impact of a reduced PVC prescription: economic and ecological gains, paramedical time savings, and decrease in adverse events related to insertion; but also, the rate of patients enduring a new PVC insertion and the discomfort caused in this regard.

Conclusion

The rate of PVC nonuse in the ED was 23.7%. The reason for prescribing "just in case" and the prescribing physician's expectation of use are the best predictors of PVC nonuse. These results suggest that a PVC should not be prescribed if the prescribing physician does not think it will be used or prescribes it "just in case".

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Code availability Not applicable.

Declarations

Conflict of interest The authors have no conflicts of interest to declare that are relevant to the content of this article.

Human and animal rights This study involving the reuse of routinely collected data fell within the scope of the MR-004 reference methodology of the French legislation. The study protocol was approved by the Sorbonne University research ethics committee and registered in the Assistance Publique-Hôpitaux de Paris studies registry (number 20211215100450).

Informed consent Patients were given an information leaflet and their verbal non-opposition was recorded. Physicians were informed about the study and agreed to have their prescription data analyzed.

References

1. Société française d'hygiène hospitalière (2005) Prévention des infections liées aux cathéters veineux périphériques. https://www.has-sante.fr/upload/docs/application/pdf/Catheters_veineux_2005_rap.pdf. Accessed 23 Feb 2023
2. Gledstone-Brown L, McHugh D (2018) Review article: idle 'just-in-case' peripheral intravenous cannulas in the emergency department: is something wrong. Emerg Med Australas 30(3):309–326. https://doi.org/10.1111/1742-6723.12877
3. Limm EI, Fang X, Dendle C, Stuart RL, Egerton Warburton D (2013) Half of all peripheral intravenous lines in an Australian tertiary emergency department are unused: pain with no gain? Ann Emerg Med 62(5):521–525. https://doi.org/10.1016/j.annemergmed.2013.02.022
4. Craigie L, Hasson S, Godin M, Lamarche D, Paquet F (2017) Prevalence of just-in-case catheters for patients in the ambulatory care emergency department. Vascular Access 11(2):9–15
5. Salvetti M, Paini A, Colonetti E, Mutti C, Bonetti S, Broggi A, Bertacchini F, Muiesan ML (2021) Intravenous access placement and fluid administration appropriateness in the emergency department. Emerg Care J. https://doi.org/10.4081/ecj.2021.9150
6. Vandenbos F, Basar A, Tempesta S, Fournier JP, Bertrand F, Vanesland L, Oualid H, Dunais B, Dellamonica P, Roger PM (2003) Relevance and complications of intravenous infusion at the emergency unit at Nice university hospital. J Infect 46(3):173–176. https://doi.org/10.1053/jinf.2002.1101
7. Guihard B, Rouyer F, Serrano D, Sudrial J, Combes X (2018) Appropriateness and complications of peripheral venous catheters placed in an emergency department. J Emerg Med 54(3):281–286. https://doi.org/10.1016/j.jemermed.2017.10.005
8. Mailhe M, Aubry C, Brouqui P, Michelet P, Raoult D, Parola P, Lagier JC (2020) Complications of peripheral venous catheters: the need to propose an alternative route of administration. Int J Antimicrob Agents 55(3):105875. https://doi.org/10.1016/j.ijantimicag.2020.105875
9. Coutaux A, Salomon L, Rosenheim M, Baccard AS, Quiertant C, Papy E, Blanchon T, Collin E, Cesselin F, Binhas M, Bourgeois P (2008) Care related pain in hospitalized patients: a cross-sectional study. Eur J Pain 12(1):3–8. https://doi.org/10.1016/j.ejpain.2007.05.002
10. Miliani K, Taravella R, Thillard D, Chauvin V, Martin E, Edouard S, Astagneau P, CATHEVAL Study Group (2017) Peripheral venous catheter-related adverse events: evaluation from a multicentre epidemiological study in France (the CATHEVAL project). PLoS ONE 12(1):e0168637. https://doi.org/10.1371/journal.pone.0168637
11. Halm MA, Gleaves M (2009) Obtaining blood samples from peripheral intravenous catheters: best practice? Am J Crit Care 18(5):474–478. https://doi.org/10.4037/ajcc2009686
12. Taboulet P, Moreira V, Haas L, Porcher R, Braganca A, Fontaine JP, Poncet MC (2009) Triage with the French emergency nurses classification in hospital scale: reliability and validity. Eur J Emerg Med 16:61–67. https://doi.org/10.1097/MEJ.0b013e328304ae57
13. Von Elm E, Altman D, Egger M, Pocock E, Gotzche P, Vandenbroucke J, Initiative STROBE (2008) The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol 61(4):344–349. https://doi.org/10.1016/j.jclinepi.2007.11.008
14. Noel F, Hoang P, Truchot J, Bard AS, Yordanov Y, Thiebaud PC (2022) An educational intervention to reduce unjustified peripheral intravenous infusions in the emergency department. Intern Emerg Med 17(4):1225–1227. https://doi.org/10.1007/s11739-021-02896-5
15. Taboulet P, Vincent-Cassy C, Squara PA, Resche-Rigon M (2009) Validité de la FRENCH, l'échelle de tri des urgences hospitalières élaborée par la Société française de médecine d'urgence. Ann Fr Med Urgence 9(1):10–16. https://doi.org/10.3166/afmu-2018-0099
16. Penaloza A, Verschuren F, Meyer G, Quentin-Georget S, Soulie C, Thys F, Roy PM (2013) Comparison of the unstructured clinician gestalt, the wells score, and the revised Geneva score to estimate pretest probability for suspected pulmonary embolism. Ann Emerg Med 62(2):117-124.e2. https://doi.org/10.1016/j.annemergmed.2012.11.002
17. Jibril F, Sharaby S, Mohamed A, Wilby KJ (2015) Intravenous versus oral acetaminophen for pain: systematic review of current

evidence to support clinical decision-making. Can J Hosp Pharm 68(3):238–247. https://doi.org/10.4212/cjhp.v68i3.1458
18. Furyk J, Levas D, Close B, Laspina K, Fitzpatrick M, Robinson K, Vangaveti VN, Ray R (2018) Intravenous versus oral paracetamol for acute pain in adults in the emergency department setting: a prospective, double-blind, double-dummy, randomised controlled trial. Emerg Med J 35(3):179–184. https://doi.org/10.1136/emermed-2017-206787