

V. Neef<sup>1</sup> · F. Piekarski<sup>1</sup> · S. Choorapoikayil<sup>1</sup> · A.U. Steinbicker<sup>1</sup> · K. Zacharowski<sup>1</sup> · P. Meybohm<sup>2</sup> · F.J. Raimann<sup>1</sup> · German PBM (Patient Blood Management) Network Group<sup>#</sup>

► **Citation:** Neef V, Piekarski F, Choorapoikayil S, Steinbicker AU, Zacharowski K, Meybohm P, et al: Changes in consciousness and assessment towards the three pillars of Patient Blood Management among nursing professions – Results from a nationwide multicentre survey at the German Patient Blood Management Network. *Anästh Intensivmed* 2022;63:XX–XX. DOI: 10.19224/ai2022.xxx

## Changes in consciousness and assessment towards the three pillars of Patient Blood Management among nursing professions

Results from a nationwide multicentre survey at the German Patient Blood Management Network

- 1 Klinik für Anästhesiologie, Intensivmedizin und Schmerztherapie  
Universitätsklinikum Frankfurt  
Goethe Universität Frankfurt  
(Direktor: Prof. Dr. K. Zacharowski)
- 2 Klinik und Poliklinik für Anästhesiologie, Intensivmedizin, Notfallmedizin und Schmerztherapie,  
Universitätsklinikum Würzburg  
(Direktor: Prof. Dr. P. Meybohm)
- # Hannah von der Ahe, Tim Allendörfer, Petra Auler, Stephanie Backes, Olaf Baumhove, Alexandra Bayer, Matthias Boschin, Ole Broch, Stephan Czerner, Tim Drescher, Bernhard Dörr, Gerd Engers, Hermann Ensinger, Andreas Farnschläder, Jens Faßl, Patrick Friederich, Jens Friedrich, Andreas Greinacher, André Gottschalk, Kristina Graf, Kerstin Große Wortmann, Oliver Grottko, Matthias Grünewald, Raphael Gukasjan, Martin Gutjahr, Karlheinz Gürtler, A. Himmel, Christian Hofstetter, Gabriele Kramer, Thomas Martel, Jan Mersmann, Matthias Meyer, Max Müller, Michael Müller, Diana Narita, Ansgar Raadts, Christoph Raspé, Beate Rothe, Anke Sauersteig, Timo Seyfried, Astrid Schmack, Axel Schmucker, Klaus Schwendner, Josef Thoma, Wolfgang Tichy, Oliver Vogt, Henry Weigt, Johanna Weiland, Manuel Wenk, Maieli Wenz, Thomas Wiederrecht, Christoph Wiesenack, Marc Winetzhammer, Michael Winterhalter and Maria Wittmann.

### Keywords

Patient Blood Management – Transfusion – Anaemia – Red blood cells

### Summary

**Background:** In the past years, Patient Blood Management (PBM) has evolved to improve the care and safety of patients. So far, the concept of PBM has been implemented in many hospitals. For a successful implementation, close cooperation between physicians and nursing professions is crucial.

**Methods:** Among 56 hospitals from the German PBM Network Group a nationwide survey was conducted from 27 October – 19 December 2020. An electronic questionnaire with 28 questions was sent to the local PBM coordinator for the distribution at hospital level. For assessment of the nursing staff's change of awareness and assessment of the hospital's PBM situation, numeric rating scales (0 (no increase) – 10 (maximum increase)) were used.

**Results:** The nursing staff's assessment of the hospital's PBM situation regarding preoperative anaemia management (7.8 ( $\pm 4.2$ )), reduction of iatrogenic blood loss (8.4 ( $\pm 3.9$ )) and the rational use of blood transfusions (7.2 ( $\pm 4.2$ )) was rated the highest by nurses working in the operating room (OR)/anaesthesiology department and among nurses with daily and frequent ( $\geq 1$ /week) PBM contact.

**Conclusions:** Our findings suggest that the nursing staff's awareness towards the concept of PBM had increased after the implementation of PBM. Changes were related to everyday clinical PBM contact and the individual nurse's field of activity.

### Introduction

Anaemia is a frequent condition with a global prevalence of about 30 % [1]. Especially in surgical patients, anaemia is increasingly recognised as a risk factor for a number of adverse outcomes, including hospitalisation, increased morbidity and mortality [2]. Patient blood management (PBM) as defined by the Society for the Advancement of Blood Management refers to “the timely application of evidence-based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patients' safety and outcome.” [3]. The concept of PBM consists of three main pillars, namely maximising red blood cell (RBC) mass to reduce anaemia (Pillar 1), minimisation and control of iatrogenic blood loss (Pillar 2), and rational use of allogeneic blood products (Pillar 3) [4,5]. So far, 107 different PBM measures, divided into six bundles, have been defined based on broad interdisciplinary fields and temporal application [6].

A successful, holistic PBM program includes the participation of a large variety of medical and hospital staff – physicians as well as nursing professions. Thus, PBM education should be targeted to physicians, pharmacists, nursing staff and other health care staff and should focus on PBM program's goals and structure [6]. An example for the first pillar is the preoperative anaemia management by supplementation of intravenous (IV)

iron, which has been demonstrated to be beneficial in patients undergoing major elective surgery [7–9]. Thus, early detection and treatment of anaemia are key strategies in these patients. A PBM nurse in an anaemia walk-in clinic with delegated authority to carry out specified clinical procedures in order to manage patient's anaemia is highly important [6]. Therefore, the PBM nurse plays an important role in the execution of the multidisciplinary and multimodal techniques involved in PBM [10].

In the past, we have already been able to show that among physicians, the awareness of preoperative anemia, the use of measures to prevent intraoperative blood loss and a rational use of blood transfusions has increased [11].

However, data on the nursing staff's awareness and assessment of the hospital's PBM situation concerning the management of preoperative anaemia, minimisation of iatrogenic blood loss and allogeneic RBC transfusion in hospitals with implemented PBM programmes are scarce. The present study analyses how the awareness of all three PBM pillars has changed among the various nursing professions. For this purpose, a questionnaire was sent to 56 hospitals participating in the German PBM Network, all located in Germany.

## Methods

The survey was conducted within hospitals ( $n = 56$ ) of the German PBM Network Group, founded in 2014. The questionnaire was made available on the website "umfrageonline" (<https://www.umfrageonline.de>). The website link of the survey was sent together with a cover letter to the local PBM coordinator to distribute the survey at their respective hospitals. Participation of the nursing staff in the survey was voluntary. The survey was active between 27 October 2020 and 19 December 2020. On 24th November, a reminder call to participate was sent to the local PBM coordinator. The survey was completely anonymous regarding the hospital as well as the participants.

The survey consisted of 28 questions. First of all, the questions covered basic demographic data of the participants (e. g. gender, age, field of activity and hospital size) and general questions about the local PBM programme (e. g., duration of implementation, availability of standard operating procedures, number of PBM measures). In addition, all three pillars of PBM were addressed by further questions (Suppl. Table 1). Anaemia was defined according to the World Health Organization (WHO) in terms of haemoglobin (Hb) concentrations  $<12$  g/dl in women and  $<13$  g/dl in men [12].

The following types of questions were used in the survey: The majority ( $n = 14$ ) had predetermined potential answers to choose from (single and multiple choice), or an additional field listed as "other" for the participant's own response. The increase in awareness was defined as gained knowledge, improved understanding and change in behaviour of the participants through implemented PBM measures towards the effect and increase of patients' safety. To assess the nursing staff's change of perception regarding the three PBM pillars, numeric rating scales ranging from 0 (no change) to 10 (maximum change) were used ( $n = 12$  questions). Two questions were open (age of the participant and the patient's waiting time (days) for elective surgery) and participants were able to enter their own responses. To assess the number of implemented PBM measures, predetermined answers (1–10, 11–20,  $\geq 21$  PBM measures) were used to cover the most important measures of all three PBM pillars. Only fully evaluated questionnaires (all 28 questions answered) were included in the analysis. Incomplete questionnaires were excluded from the analysis.

## Statistical analysis

All responses of the participants were exported to Microsoft Excel (Excel 365, Microsoft Corp., Redmond, USA) for statistical analysis. Descriptive statistical methods mean  $\pm$  standard deviation (SD) or median and interquartile range (IQR;

25 %/75 %) were used to analyse data. The Shapiro-Wilk test was used to assess normality of continuous variables. Normally distributed data were compared with the Student's *t*-test. Non-normally distributed data were compared with the Mann-Whitney-U test. Categorical variables were compared with the chi squared test or Fisher's exact test. For group comparisons, the Kruskal-Wallis test was used. Statistical analysis and graphical illustration were performed using SPSS® software (SPSS Statistics for Windows, version 21.0; IBM Corp., Armonk, NY, USA). A *p*-value  $<0.05$  was considered statistically significant.

## Results

### Characteristics of respondents

A total of 233 participants responded to the questionnaire, 161 (69.1 %) of them completed the survey. Respondents who did not complete the questionnaire were excluded from further analysis ( $n = 72$ ; 30.9 %). Overall, 73.9 % of participants were female, 25.5 % were male, and 0.6 % of respondents were of diverse genders. The mean age ( $\pm$ SD) was 42.0 ( $\pm 11.7$ ) years. The various nursing professions included nurses (42.2 %) and nurses with additional qualifications (41.6 %), anaesthesia nurses (7.5 %), medical-technical assistants (5.0 %), and other qualifications (3.7 %). The field of nursing activity was attributable to the regular ward (35.4 %), intensive care unit (ICU) or intermediate care (IMC) (31.7 %), operating room (OR) or anaesthesiology department (21.7 %), emergency department (8.7 %) and others (2.5 %) (see Tab. 1).

### Organisation of Patient Blood Management

In total, 71.4 % participants reported of having local guidelines for PBM practice/standard operating procedures (SOPs) at their hospital, 23.0 % could not provide detailed knowledge and 5.6 % did not have any local guidelines. Regarding preoperative anaemia management, the majority of participants reported applying anaemia manage-

**Table 1**  
Characteristics of participants and organisation of Patient Blood Management.

Characteristics	Participants (n)	Percentage (%)
Age (years)*	42.0 (±11.7)	
<b>Gender</b>		
Female	119	73.9
Male	41	25.5
Diverse	1	0.6
<b>Type of Hospital</b>		
University hospital	100	62.1
Standard care hospitals	21	13.0
Major regional hospitals	20	12.4
Maximum care hospital	15	9.3
Others	5	3.1
<b>Field of Activity</b>		
Normal ward	57	35.4
ICU/IMC	51	31.7
Operating room/Anaesthesiology	35	21.7
Emergency Department	14	8.7
Others	4	2.5
<b>Nursing profession qualification</b>		
Nursing	68	42.2
Nursing with additional qualification	67	41.6
Anaesthesia nurse	12	7.5
Medical-technical assistant	8	5.0
Others	6	3.7
<b>Organisation</b>	<b>Participants (n)</b>	<b>Percentage (%)</b>
<b>Availability of guidelines for PBM</b>		
Yes	115	71.4
No	9	5.6
No detailed knowledge	37	23.0
<b>Existence of preoperative anaemia management</b>		
Yes	92	57.1
No	69	42.9
<b>Number of implemented PBM measures</b>		
0–10	24	14.9
11–20	13	8.1
21–30	9	5.6
>30	5	3.1
No detailed knowledge	110	68.3
<b>Everyday contact with PBM</b>		
Daily	56	34.8
Frequent (≥1/week)	41	25.5
Rare (<1/week)	58	36.0
No detailed knowledge	6	3.7
<b>Days of anaemia management prior to surgery (days)*</b>	6.1 (±8.7)	
<b>Duration of PBM programme (years)*</b>	3.9 (±2.1)	

\* Results are expressed as mean (±SD).

ICU: Intensive Care Unit; IMC: Intermediate Care; PBM: Patient Blood Management.

ment before surgery (57.1 %). Of all participants, 34.8 % reported of having daily, 36.0 % rare (<1/week) or 35.5 % frequent (≥1/week) contact with PBM (Tab. 1).

### Changes in awareness towards measures designed to reduce iatrogenic blood losses and the rational application of blood products

Question No. 21 “Would you think of particularly using tranexamic acid during surgical operations involving higher blood losses (≥500 ml)” was rated the highest among nurses working in the OR/anaesthesiology department (8.3 (±2.7)) compared to nurses on the ICU/IMC (6.5 (±4.2), regular ward (4.8 (±4.3), other departments (4.8 (±4.2) and the emergency department (1.2 (±4.3).

Changes in awareness towards the impact of allogeneic RBC transfusions on patients’ outcome occurred most often in nurses working in the OR/anaesthesiology department (8.7 (±4.0)) compared to nurses working in other departments (6.8 (±3.4);  $p = 0.419$ ), ICU/IMC (6.8 (±4.0);  $p = 0.062$ ), regular ward (5.6 (±4.0);  $p = 0.005$ ), and emergency department (4.2 (±4.0);  $p = 0.005$ ) (Fig. 1).

### Assessment of the hospital’s situation depending on everyday PBM contact

The assessment of the hospital’s PBM situation regarding the implementation of preoperative anaemia management was highest rated by nurses with daily and frequent (≥1/week) PBM contact compared to nurses with rare (<1/week) PBM contact (daily 5.7 (±4.2) vs. frequent 6.1 (±4.2) vs. rare 4.5 (±4.2), respectively, not statistically significant).

The assessment of the hospital’s PBM situation regarding the reduction of iatrogenic blood loss was rated higher by nurses with daily contact (7.0 (±3.9);  $p = 0.019$ ) and frequent contact (7.4 (±3.9);  $p = 0.023$ ) compared to rare PBM contact (5.2 (±4.0)).

The assessment of rational employment of blood products was also rated higher by nurses with daily contact ( $6.8 (\pm 4.1)$ ;  $p < 0.001$ ) and frequent contact ( $6.5 (\pm 4.2)$ ;  $p = 0.005$ ) compared to rare PBM contact ( $3.6 (\pm 4.2)$ ). The evaluation of these results refers to questions No. 26 to 28 (Fig. 2).

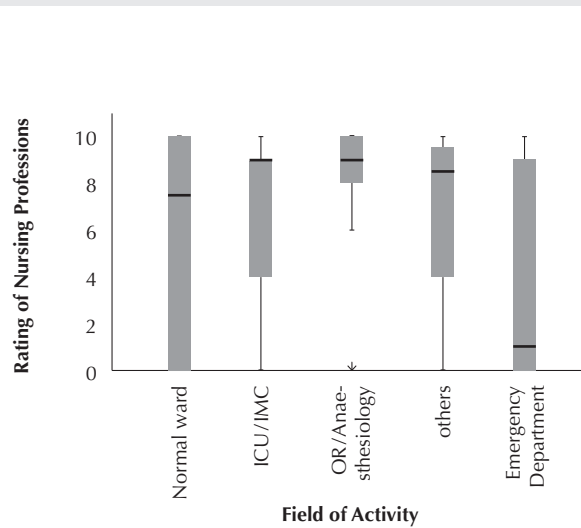
### Assessment of the hospital's situation depending on the field of activity

The assessment of the hospital's PBM situation regarding the implementation of preoperative anaemia management was rated the highest by nurses from the OR/anaesthesiology department, followed by ICU/IMC, regular ward, emergency department and other departments ( $7.8 (\pm 4.2)$  vs.  $5.5 (\pm 4.2)$  vs.  $4.5 (\pm 4.3)$  vs.  $3.3 (\pm 4.1)$  vs.  $2.5 (\pm 4.4)$  respectively). Differences were significant between the OR/anaesthesiology vs. emergency department ( $p = 0.002$ ), regular ward ( $p = 0.001$ ), ICU/IMC ( $p = 0.013$ ) and others ( $p = 0.034$ ).

The assessment of the hospital's PBM situation regarding the reduction of iatrogenic blood loss was rated  $8.4 (\pm 3.9)$ ,  $6.4 (\pm 3.9)$ ,  $5.9 (\pm 4.1)$ ,  $4.4 (\pm 4.0)$ ,  $4.3 (\pm 3.8)$  by nurses from the OR/anaesthesiology department, ICU/IMC, regular ward, emergency department and other departments, respectively. Changes were statistically significant between OR/anaesthesiology vs. emergency department ( $p = 0.003$ ), regular ward ( $p = 0.007$ ) and ICU/IMC ( $p = 0.034$ ).

The nurses' assessment of rational use of blood products was rated  $7.2 (\pm 4.2)$ ,  $6.1 (\pm 4.1)$ ,  $4.7 (\pm 4.2)$ ,  $4.8 (\pm 4.3)$  and  $2.8 (\pm 4.2)$  by nurses from the OR/anaesthesiology department, ICU/IMC, regular ward, other departments and emergency department, respectively. Differences were statistically significant between the emergency department vs. ICU/IMC ( $p = 0.010$ ) and OR/anaesthesiology ( $p = 0.001$ ). Comparison of OR/anaesthesiology vs. regular ward also reached statistical significance ( $p = 0.011$ ). The evaluation of these results refers to questions No. 26 to 28 (Fig. 3).

Figure 1



### Rating of changes in awareness towards the impact of RBC transfusion on patient outcome.

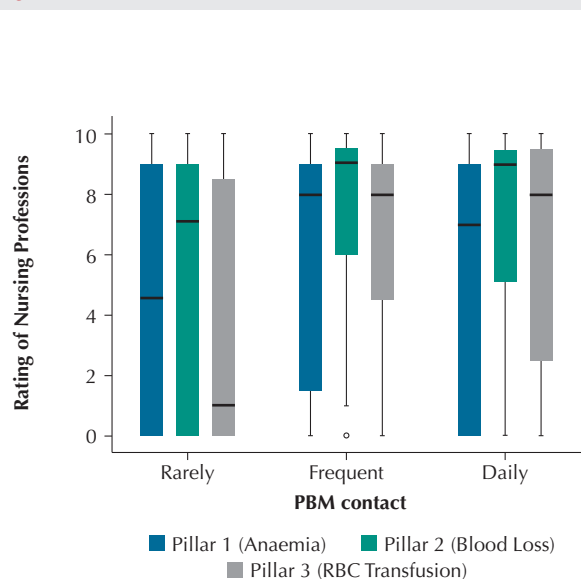
Box-and-whisker plot showing the the impact of RBC transfusion as rated by nurses employed in various fields of activity (numerical rating scale 0 (no change) -10 (maximum change)).

The significance of comparisons was rated with the Kruskal-Wallis test. The horizontal lines represent median values.

$p = 0.005$  for comparing regular ward vs. OR/Anaesthesiology;  $p = 0.005$  for comparing emergency department vs. OR/Anaesthesiology.

**ICU:** Intensive care unit;  
**IMC:** Intermediate care;  
**OR:** Operating room.

Figure 2



### Assessment of the hospital's situation depending on everyday clinical contact.

Assessment of PBM implementation and situation at the hospital according to nursing staff. The significance of comparisons was rated with the Kruskal-Wallis test. The horizontal lines represent median values.

Frequent PBM contact:  $\geq 1$ /week; Rare PBM contact:  $< 1$ /week.

Pillar 1: no significances were obtained; Pillar 2:  $p = 0.023$  for comparing rarely vs. frequent;  $p = 0.019$  for comparing rarely vs. daily; Pillar 3:  $p = 0.005$  for comparing rarely vs. frequent;  $p < 0.001$  for comparing rarely vs. daily.

**PBM:** Patient Blood Management; **RBC:** Red blood cell.

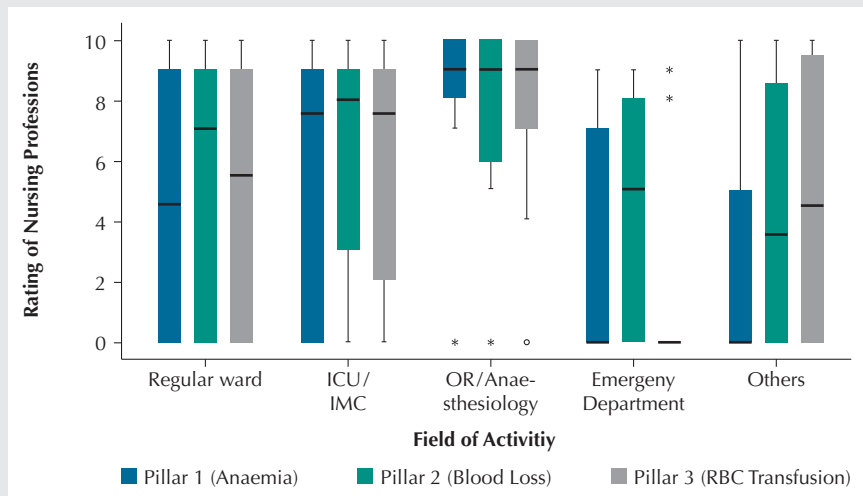
## Discussion

Our nationwide survey was the first to evaluate changes in awareness towards PBM and the assessment of the PBM situation at the hospital among nursing

professions of 56 hospitals participating in the German PBM Network Group via an online survey. Of 233 participants in total, 69.1 % completed the questionnaire and were included in the analysis.



Figure 3



#### Assessment of the hospital's situation depending on field of activity.

Assessment of PBM implementation and situation at the hospital according to nursing staff. The significance of comparisons was rated with the Kruskal-Wallis test. The horizontal lines represent median values.

Pillar 1:  $p = 0.002$  for comparing emergency department vs. OR/Anaesthesiology;  $p = 0.034$  for comparing others vs. OR/Anaesthesiology;  $p = 0.001$  for comparing regular ward vs. OR/Anaesthesiology;  $p = 0.013$  for comparing ICU/IMC vs. OR/Anaesthesiology; Pillar 2:  $p = 0.003$  for comparing emergency department vs. OR/Anaesthesiology;  $p = 0.007$  for comparing regular ward vs. OR/Anaesthesiology;  $p = 0.034$  for comparing ICU/IMC vs. OR/Anaesthesiology; Pillar 3:  $p = 0.010$  for comparing emergency department vs. ICU/IMC;  $p = 0.001$  for comparing emergency department vs. OR/Anaesthesiology;  $p = 0.011$  for comparing regular ward vs. OR/Anaesthesiology.

ICU: Intensive care unit; IMC: Intermediate care; OR: Operating room; RBC: Red blood cell.

Our results revealed that the change in awareness towards the use of tranexamic acid and the impact of allogeneic RBC transfusions was highest among the nursing professions working at the OR/anaesthesiology department compared to all other departments analysed (regular ward, emergency department and others). Furthermore, assessment of the hospital's PBM situation was rated the highest by nursing professions who had daily and frequent contact with PBM compared to nurses with rare PBM contact.

During the last decade, PBM has proven to be widely effective and is increasingly incorporated into standard patients' safety and care. The WHO urged member states to implement and promote PBM in their clinical practice in 2010 [13]. So far, many hospitals have successfully implemented PBM programmes at their institutions [14,15].

In our study group, the majority (71.4 %) reported of existing local guidelines for

the implementation of PBM. For local success, it is important to translate international PBM guidelines into practical day-to-day recommendations on a local level. Therefore, the existence of hospital specific, local PBM guidelines (e. g. for use in case of massive transfusion/massive haemorrhage or preoperative anaemia management) are strongly recommended [16]. Our results of local PBM instructions are in line with results of a recent study conducted among ten European hospitals by the PaBloE working group, where local guidelines were in place in seven out of ten hospitals (70.0 %) [17]. In addition, 57.1 % of the participants reported existence of anaemia management before surgery. Literature reveals that the supplementation of IV iron increases perioperative haemoglobin (Hb) levels and reduces the need for allogeneic RBC transfusions in surgical patients [18]. A study by Triphaus et al. revealed that IV iron supplementation >7 days before surgery

resulted in preoperative increase of (median (IQR)) Hb levels of 0 (-0.2; 0.4) g/dl, 0 (-0.2; 0.6) g/dl, and 0.6 (-0.1; 1.3) g/dl in patients with mild ( $n = 52$ ), moderate ( $n = 47$ ), and severe ( $n = 4$ ) anaemia, respectively [19]. Ellermann et al. revealed that IV iron substitution was most effective to increase Hb in 1110 patients 17–22 days prior to surgery, also in surgical disciplines with lower expected blood loss such as gynaecology [9].

Tranexamic acid is an essential compound of PBM. Our study demonstrated that the awareness towards the use of tranexamic acid in case of bleeding situations >500 ml was rated the highest by nursing staff professions working in the OR/anaesthesiology department. It is logical, as tranexamic acid is mostly used in a surgical setting during major surgery [20]. This fact explains that changes were the highest rated by nurses employed in this department, whereas awareness towards tranexamic acid was the lowest in the emergency department. One cause might be that in severely injured trauma patients, tranexamic acid is often already applied by the emergency physician prior to hospitalisation of the patient [21]. In case of major bleeding and in settings involving massive transfusion, tranexamic acid is given repeatedly. This might proceed in the OR by continuous application.

The results of the assessment of the hospital's PBM situation among nursing professions demonstrate that changes were the highest among nursing staff members who had daily and frequent PBM contact as well as nursing staff of the OR/anaesthesiology department and ICU/IMC. Further analysis of our study population revealed that daily and frequent PBM contact was stated the most by nurses of the OR/anaesthesiology department (68.6 %) and ICU/IMC staff (68.0 %). The observations that nurses from the OR/anaesthesiology department had daily and frequent PBM contact logically depend on each other: in a perioperative setting, nurses from the OR/anaesthesiology department and ICU/IMC are commonly confronted with the management of bleeding situ-

ations, anaemia and RBC transfusion during surgery [22]. Severe bleeding complications may occur more often in the OR compared to the regular ward and therefore nurses from the OR/anaesthesiology department have more routine in the management of bleeding episodes. In addition, patients with risk factors for postoperative bleeding (e. g. oral anticoagulant intake) are more likely to be admitted to the ICU/IMC after major surgery than to the regular ward. According to our study, a change in awareness was defined as gained PBM knowledge and understanding that resulted in a change of behaviour. Critically, this could also be interpreted as a change in the nurses' opinion on the use of tranexamic acid.

Nonetheless, preparation of patients undergoing major elective surgery, preoperative assessment of laboratory examinations in surgical outpatient clinics by nursing professions is crucial. This way, preoperative anaemia and iron deficiency screening can be conducted [6]. In this case, close cooperation of nurses and physicians is crucial, as iron deficient or anaemic patients can be identified and supplemented with IV iron accordingly.

However, as this is the first time investigating a large cohort of nursing professions in the context of PBM so far, comparison with other studies is not feasible.

Interestingly, 68.3 % of the participants stated they could not provide detailed knowledge of the number of implemented PBM measures. This fact emphasises the need for education as a major part of a holistic PBM program. Meybohm et al. states that educational activities regarding PBM should occur initially and regularly, at least annually, and should be endorsed by public and medical authorities. Furthermore, easy accessible learning materials should be available, e. g. via websites, guidelines, seminars or posters [6].

### Limitations

An important limitation of our study is the selection of participants in our study. As all hospitals are part of the Germany

PBM Network Group, contact with PBM and understanding of PBM may be better compared to nursing professions from hospitals without PBM programmes. This fact may result in selection bias. Furthermore, multiple participants might have come from the same hospital. Therefore, we cannot exclude that some outcomes are clustered and represent institutional rather than individual changes. Another limitation is that the experience of the nursing staff in the respective area of activity has not been surveyed. Accordingly, an evaluation of employees who have only been working with PBM at the clinic for a short time should be evaluated with caution.

### Conclusions

**In conclusion, our findings indicate that the nursing staff's awareness towards the concept of PBM has increased. The nursing staff's assessment of the hospital's PBM situation regarding the management of preoperative anaemia, reduction of iatrogenic blood loss and reduction of RBC transfusions depended on the frequency of clinical PBM contact and the areas of the nursing staff's employment. However, organised PBM education and training seminars are essential to increase the knowledge of all nursing specialisations involved.**

### Competing interests

K.Z.'s department received grants from B. Braun Melsungen, CSL Behring, Fresenius Kabi, and ViforPharma for the implementation of Frankfurt's Patient Blood Management program. KZ has received honoraria for participation in advisory board meetings for Haemonetics and Vifor and received speaker fees from CSL Behring and GE Healthcare. He is the Principal Investigator of the EU-Horizon 2020 project ENVISION (Intelligent plug-and-play digital tool for real-time surveillance of COVID-19 patients and smart decision-making in Intensive Care Units) and Horizon Europe 2021 project COVend (Biomarker and AI-supported FX06 therapy to prevent progression from mild and moderate to severe stages

of COVID-19). K.Z. and P.M. received honoraria for scientific lectures from B. Braun Melsungen, Vifor Pharma, Ferring, CSL Behring, and Pharmacosmos. F.P. received honoraria from Pharmacosmos for scientific lectures. F.J.R. received grants from HemoSonics LLC and honoraria for scientific lectures from Keller Medical GmbH. All other authors declare no competing interests.

### Financial support

This study was financially supported by internal research funds of the clinic for Anaesthesiology, Intensive Care Medicine and Pain Therapy, University Clinic of the Goethe University, Frankfurt, Germany.

### Acknowledgement

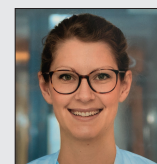
We thank all participants for processing the survey and the PBM co-ordinators in Germany for distributing the invitation to participate.

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### Correspondence address



**Dr. med.  
Vanessa Neef**

Department of Anaesthesiology,  
Intensive Care Medicine and Pain  
Therapy  
University Hospital Frankfurt  
Goethe University  
Theodor-Stern Kai 7  
60590 Frankfurt, Germany  
Phone: 0049 151 17191595  
Mail: [Vanessa.Neef@kgu.de](mailto:Vanessa.Neef@kgu.de)  
ORCID-ID: 0000-0002-1793-2918

Supplemental Table 1: Questionnaire

1	What is your gender?
2	How old are you?
3	What is your hospital's level of care?
4	What is your medical discipline?
5	What is your medical qualification?
6	How long has the PBM programme already been implemented at your hospital?
7	Do you have local guidelines regarding PBM at your hospital?
8	How often are you in contact with PBM in everyday clinical practice?
9	How many PBM measures are implemented at your hospital?
10	How do you rate the benefit of the PBM programme at your hospital?
11	How do you rate the realization of the PBM programme at your hospital?
12	How many days in advance are patients contacted before elective surgery?
13	When preparing patients for elective surgery – do you check for preoperative anaemia more often after the implementation of PBM?
14	Is preoperative anaemia management conducted at your hospital?
15	Who is responsible for preoperative anaemia management at your hospital?
16	How do you rate the importance of preoperative anaemia management?
17	How do you rate the usefulness of preoperative anaemia management in patients undergoing elective surgery?
18	Do your patients (from your medical discipline) undergo preoperative anaemia management?
19	In case of no existing preoperative anaemia management – Do you wish for preoperative anaemia management?
20	How do you rate the subjective increase in prudent use of resource blood after the implementation of PBM?
21	In case of intraoperative blood loss > 500 ml: Has your attitude towards the use of tranexamic acid increased after the implementation of PBM?
22	In case of intraoperative blood loss > 500 ml: Has your attitude towards the use of cell salvage increased after the implementation of PBM?
23	Has your transfusion practice changed after the implementation of PBM?
24	Did your subjective awareness increase regarding the fact, that the transfusion of RBCs may have negative impact on patient's surgical outcome?
25	Did the number of cross-matched RBCs prior to elective surgery decrease?
26	How do you rate your subjective increase in awareness towards anaemia after the implementation of PBM?
27	How do you rate your subjective increase in awareness towards patient's blood resource after the implementation of PBM?
28	How do you rate your subjective increase in awareness towards transfusion after the implementation of PBM?

**PBM:** Patient Blood Management; **RBC:** Red blood cells.