

Standards of perioperative management in total knee and hip arthroplasty procedures. A survey-based study. Part I: Preoperative management

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Abstract

Background: Recent years have seen an increasing number of elective total knee (TKA) and hip arthroplasty (THA) procedures. Since a wide variety of methods and procedures are used in perioperative management, a survey-based study was carried out to identify the patterns of practice in Polish hospitals.

Methods: With the help of the LimeSurvey application, questionnaires for anaesthesiologists and orthopaedists were prepared to gain insight into the preparation of patients for TKA and THA procedures and perioperative care. Questionnaires included both single and multiple-choice questions concerning among other things type of laboratory tests, additional examinations and consultations performed on a routine basis before elective TKA and THA procedures.

Results: A total of 162 medical centres took part in the study. Questionnaire responses were obtained from 93 (57%) orthopaedics teams and 112 (69%) anaesthesiology teams. A mean (standard deviation, SD) of 7.2 (3.5) laboratory tests are routinely ordered before surgery. For example, 47% of orthopaedists and 20% of anaesthesiologists order urinalysis, while 53% of orthopaedists and 26% of anaesthesiologists order a CRP test. Seventy-nine per cent of orthopaedists refer patients for at least one specialist consultation before the procedure. Dental consultation is requested by 40%, gynaecological consultation by 27%. Patient preoperative education is provided by 85% of orthopaedists and preoperative rehabilitation is prescribed by 46% of them. A total of 56% surveyed anaesthesiologists perform pre-anaesthetic evaluation upon patients' hospital admission.

Conclusions: The study found that the number of examinations and specialist consultations conducted in Polish hospitals exceeded the scope of recommendations of scientific societies. Furthermore, the authors identified a need to standardise perioperative management in the form of Polish guidelines or recommendations, with the intention to improve patient safety and optimize health care expenses.

Key words: TKA, ERAS, THA, knee, replacement, surveys and questionnaires, hip, arthroplasty, perioperative medicine, medical overuse.

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The number of elective total knee arthroplasty (TKA) and total hip arthroplasty (THA) procedures performed in Poland has been growing in recent years. The National Health Fund (NFZ) data from 2005-2021 demonstrated that in Poland the number of TKAs increased from 4072 to 29614 annually, and the number of THAs increased from 26091 to 55337 annually [1]. In light of ongoing demographic changes, it is likely that the increasing trend will continue.

Following exploratory interviews in the Polish community of orthopaedists and anaesthesiologists, the authors noted a wide variety of perioperative methods and procedures depending on the health care institution and medical practitioners' own experience. To gain further insight into this area, a survey-based study was conducted to identify perioperative management practices used in this group of patients in Polish hospitals. The findings of the study, in combination with already existing recommendations and international guidelines, may serve as a foundation for implementing a standardised perioperative care system in Poland. Since the study was multifaceted, the data pool was divided into issues related to preoperative and perioperative management separately and the results will be published in three independent publications. The financial aspects could not be ignored – multiplication of procedures and tests increase financial burden and extend redundant time of hospitalisation. One of main problems in that context seems to be excessive ordering of specialist consultations and using pre-defined sets of laboratory tests as 'routine panels', without taking into consideration individual clinical characteristic of each patient separately.

METHODS

The study was approved by the Bioethics Committee at the Jagiellonian University in Cracow (Decision No. 1072.6120.259.2020 of 24 September 2020). The study aimed to determine the contemporary clinical practice in terms of orthopaedic and anaesthetic preparation of patients for elective TKA and THA procedures in Polish hospitals. The questionnaire was compiled following a literature review. In this way, it was possible to determine the elements of therapy that are associated with clear benefits according to available scientific evidence, such as thromboprophylaxis, multimodal analgesia, regional nerve blocks, and early upright positioning. In addition, a number of elements for which there is no clear scientific basis were also identified, including preoperative antibiotic therapy in patients with asymptomatic bacteriuria, and selection of dose of tranexamic acid. The research survey was conducted in order to establish whether clinical prac-

tice in Poland is cohesive among local healthcare professionals and consistent with worldwide standards and guidelines.

Survey development

The survey's questions were divided into two groups: survey 1 – for orthopaedists (30 questions) [Survey S1], survey 2 – for anaesthesiologists (24 questions) [Survey S2]. The analysis included responses both from medical specialists and physicians during their specialty training. The survey consisted of both single and multiple-choice questions, which was taken into account during statistical data analysis. The questions were drawn up in collaboration with the national consultants for Orthopaedics and Traumatology and Anaesthesiology and Intensive Care. In order to reach as many health care institutions and medical practitioners in Poland as possible, the LimeSurvey application (version 3.26.1+210427) [2] was used to generate an electronic questionnaire which was then shared online with survey participants. Any number of participants from each centre could take part in the survey. Participation in the study was anonymous and completely voluntary.

Survey validation

The survey was designed and executed by the study investigators. After creation of initial version of the survey it was spread among investigator's close local collaborators in the area of anaesthesiology and orthopaedics with enquiry to complete the survey and share their opinion and feedback regarding survey itself. After taking into consideration their comments the survey was adjusted accordingly.

Data collection

The survey was sent to all health care institutions in Poland performing elective TKA and THA procedures in adult patients. A list of health care institutions was obtained from the National Health Fund (NFZ) data thanks to collaboration with the National Centre for Quality Assessment in Healthcare. The study was promoted through websites, in social media channels, and via personal contacts. It was carried out in two rounds: 17 May – 30 July 2021 and 3 August – 24 August 2021. One person was responsible for contact with all health care institutions (all centres were phone called twice in each round, two weeks apart). All gathered data will be kept in secure files for 10 years.

Statistical analysis

Analysis encompass responses regarding ordered laboratory tests, additional tests, specialist

TABLE 1. Comparison of survey responses submitted by medical practitioners (by medical speciality and length of work experience)

Work experience	Anaesthesiology (n = 239)	Orthopaedics (n = 131)
< 5 years	45 (19%)	13 (10%)
6–10 years	67 (28%)	21 (16%)
11–15 years	40 (17%)	12 (9%)
16–20 years	18 (8%)	16 (12%)
> 20 years	69 (29%)	69 (53%)

Values are presented as number (percentage).

TABLE 2. Laboratory tests ordered by medical speciality

Type of laboratory test	Orthopaedics	Anaesthesiology	P-value
Complete blood count	147 (79%)	297 (99%)	< 0.001
Iron	3 (2%)	2 (1%)	0.595
Electrolytes	141 (75%)	284 (95%)	< 0.001
Creatinine	132 (71%)	234 (78%)	0.072
Urea	100 (53%)	158 (53%)	0.966
APTT/INR	100 (53%)	263 (88%)	< 0.001
CRP	99 (53%)	78 (26%)	< 0.001
ESR	46 (25%)	12 (4%)	< 0.001
Troponins	2 (1%)	3 (1%)	1.000
BNP/NT-proBNP	1 (1%)	1 (0%)	1.000
Fasting blood glucose	97 (52%)	170 (57%)	0.327
Incidental blood glucose	14 (7%)	32 (11%)	0.308
Blood group	137 (73%)	256 (86%)	0.001
Urinalysis	88 (47%)	60 (20%)	< 0.001

Values are presented as number (percentage). A detailed table including responses distribution of all questions concerning laboratory tests is placed in the Supplement Table 1

APTT – activated partial thromboplastin time, INR – international normalized ratio, CRP – C-reactive protein, ESR – erythrocyte sedimentation rate, BNP – B-type natriuretic peptide, NT-proBNP – N-terminal pro-brain natriuretic peptide

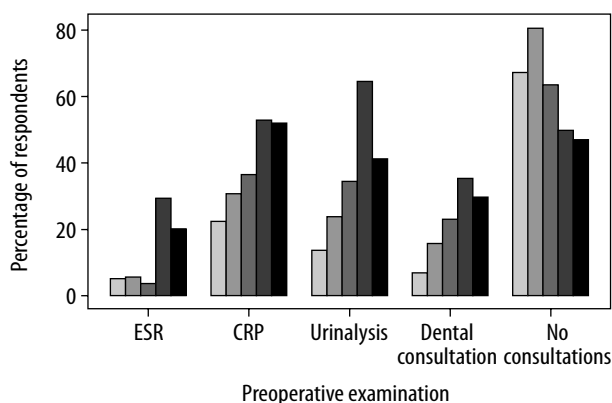


FIGURE 1. Relationship between length of work experience and number of ordered laboratory tests: ESR, CRP, urinalysis, dental consultation, and no preoperative consultations

consultations, providing prehabilitation, setting of preanaesthetic evaluation in matter of place and time before surgery, applying perioperative protocol, possibility of providing fast-track approach to TKA and THA procedure. Analysis covered also comparison of approach between anaesthesiologists and orthopaedists as well as possible influence of responder. The results obtained in the study were analysed statistically with the R and Python programming languages using appropriate data analysis libraries. Since the survey responses were binary, Yates's χ^2 test was applied for the purpose of comparison. For multivariate modelling, logistic regression was used. Only complete responses were included in the analysis, so the denominator varied slightly between questions depending on the number of missing responses. To determine the measure of concordance across the medical centres, an intra-class correlation coefficient was used.

RESULTS

A total of 162 health care institutions took part in the study. Survey responses were submitted by 93 (57%) orthopaedics teams and 112 (69%) anaesthesiology teams. A total of 187 responses from orthopaedists and 299 responses from anaesthesiologists were obtained. In 41 medical centres, survey responses were provided by both groups of medical practitioners. In 63 (39%) centres, responses were submitted by at least two physicians of a given speciality. More than half of the respondents were from small hospitals (< 600 beds), and the highest number of responses came from medical practitioners with over 20 years professional experience. Fewer laboratory tests were found to be ordered in larger hospitals. Table 1 lists data on the medical practitioners' length of work experience. Table 2 summarises the responses of orthopaedists and anaesthesiologists to the question regarding routine ordering of laboratory tests prior to elective TKA and THA procedures.

The survey findings show that mean (standard deviation) 7.2 (SD 3.5) laboratory tests are routinely ordered preoperatively. Figure 1 shows relationship between the length of work experience and the number of ordered laboratory tests by medical practitioners. 75% of orthopaedists and 92% of anaesthesiologists routinely order an ECG test, while 36% of orthopaedists and 32% of anaesthesiologists refer patients for an X-ray. Table S2 lists the number of routinely performed additional examinations, and Table S3 – imaging evaluations of the surgical site. Data on specialist consultations are summarised in Table 3. Overall, 18% of anaesthesiologists and 79% of orthopaedists refer patients for at least one specialist consultation on a routine basis.

TABLE 3. Specialist consultations ordered by medical speciality

Type of consultation	Orthopaedics	Anaesthesiology	P-value
None	40 (21%)	244 (82%)	< 0.001
Internal medicine/family physician	64 (34%)	32 (11%)	< 0.001
Internal medicine physician	14 (7%)	9 (3%)	0.041
Family physician	11 (6%)	6 (2%)	0.045
Cardiologist	19 (10%)	4 (1%)	< 0.001
Pulmonologist	1 (1%)	0 (0%)	0.813
Gynaecologist	50 (27%)	9 (3%)	< 0.001
Dentist	74 (40%)	18 (6%)	< 0.001
Laryngologist	20 (11%)	6 (2%)	< 0.001
Vascular surgeon	6 (3%)	1 (0%)	0.028
Physiotherapist	2 (1%)	3 (1%)	1.000
Dietitian	0 (0%)	1 (0%)	1.000

Six medical centres participating in the study submitted more than 10 responses to the survey questions in both study groups. The intraclass correlation coefficient (ICC) was calculated as 0.6-0.8. On that basis, the correlation of responses was confirmed.

A statistically significant difference was noted between the groups as regards the frequency of ordering CRP and ESR tests, urinalysis, and consultations with a cardiologist, gynaecologist, laryngologist, and internal medicine/family physician (Figure 2).

The findings of the study regarding patient education, preoperative rehabilitation, management of asymptomatic bacteriuria, place and time of pre-anesthetic evaluation are summarised in Table 4. A comparison of responses by medical specialty, work experience or hospital size showed no significant differences between these groups.

The survey also addressed the application of a standardised perioperative procedure. A total of 87 (29%) anaesthesiologists confirmed application of such regarding both surgery types, four (1.3%) only for TKA, and one (0.3%) only for THA. In contrast, in the group of orthopaedists, there were 126 (67%) confirmative responses for TKA and THA, four (2.1%) for THA only and one (0.5%) answer for TKA only. Standardised perioperative procedures were implemented more commonly in small medical centres compared to large hospitals. More laboratory tests and consultations were ordered in the health care institutions using perioperative procedures.

Figure S3 presents a comparison of incidence of laboratory tests and consultations ordered by medical practitioners (expressed as percentage), in reference to perioperative procedure application and hospital size.

Same-day TKA and THA procedures are performed in just four hospitals in Poland.

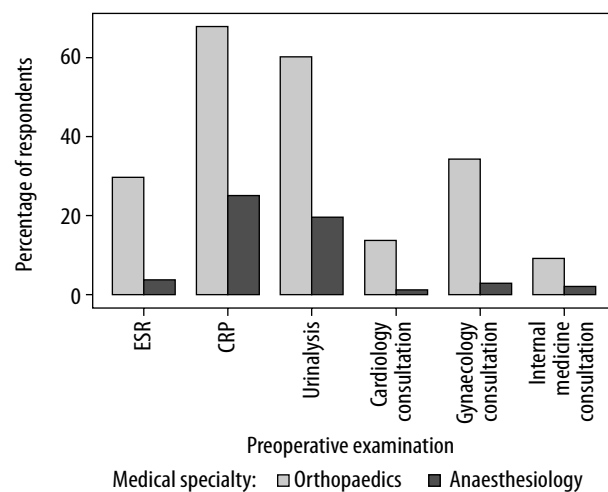


FIGURE 2. Comparison of frequencies of preoperative examinations ordered by orthopaedists and anaesthesiologists

DISCUSSION

Appropriate preoperative preparation for TKA and THA procedures is of fundamental importance, as it has a direct impact on the risk of perioperative complications [3]. The survey showed that physicians performing patient eligibility assessment for surgery and preanaesthesia evaluation order a wide panel of laboratory tests (e.g. CRP, ESR, glucose, urinalysis), imaging assessments, and specialist consultations. Most orthopaedists order a urinalysis before surgery, even in patients not presenting symptoms of urinary tract infection. Patient education is provided primarily during the assessment of eligibility for TKA/THA or upon hospital admission. However, more than half of orthopaedists do not routinely prescribe preoperative rehabilitation. More examinations and consultations are carried out in hospitals, where a perioperative protocol is followed.

TABLE 4. Intervention of patient's education, preoperative rehabilitation, management of asymptomatic bacteriuria, place, and time of pre-anaesthetic evaluation

Intervention	Responses	YES (%)
Asymptomatic bacteriuria*	I never order this test in asymptomatic patients	43/145 (30%)
	I never prescribe antibiotics in such cases	21/145 (14%)
	Yes, after obtaining microbiological test results, I prescribe targeted antibiotics (based on antibiotic susceptibility test results)	34/145 (23%)
	Yes, I prescribe empiric antibiotics	10/145 (7%)
	I order a repeat urine test and if it is positive again, I prescribe targeted antibiotics (based on antibiotic susceptibility test results)	37/145 (26%)
Preoperative rehabilitation*	I do not prescribe it	79/146 (54%)
	Yes, covered by the National Health Fund (NFZ)	14/146 (10%)
	Yes, privately funded rehabilitation services	49/146 (34%)
Preoperative education*	No, I never use it	22/146 (15%)
	Yes, during eligibility assessment	82/146 (56%)
	Yes, as a separate session/course	3/146 (2%)
	Yes, upon hospital admission	51/146 (35%)
	Yes, brochures and posters	48/146 (33%)
Location and time of pre-anaesthesia evaluation**	Upon hospital admission	166/299 (56%)
	In anaesthesia clinic prior to hospital admission	53/299 (18%)
	Preliminary assessment in anaesthesia clinic prior to hospital admission, final assessment upon admission to the orthopaedics department	80/299 (27%)

*Responses from orthopaedists.

**Responses from anaesthesiologists.

Guidelines of the Canadian Anaesthesiology Society (CAS) [4] and practice advisory issued by the American Society of Anaesthesiologists (ASA) [3] highlight that preoperative evaluations should not be performed on a routine basis [3, 4], but selectively, to guide or optimise preoperative management [4]. The ASA has additionally defined clinical characteristics of patients to be used by anaesthesiologists, as an aid in decision-making process. A slightly different approach has been taken by the authors of the UK's National Institute for Health and Care Excellence (NICE) guidelines, who advise that the panel of tests should be selected depending on the extent of surgery, taking into consideration the ASA system, with TKA and THA classified as major procedures [5]. The European Society of Anaesthesiology and Intensive Care (ESAIC) supports the NICE guidelines without any modifications [6]. Tables 5 and 6 list the NICE, ASA and CAS guidelines content together with specific types of laboratory tests and additional examinations recommended.

In 2016, the Polish Agency for Health Technology Assessment and Tariff System prepared a report [7] presenting an expert statement based on global guidelines published before 2016. The report lists a set of tests and examinations, which are required before surgery (ECG with interpretation, urinalysis, CRP, CBC with differential, electrolytes, and glucose)

and a panel of recommended tests (urea, creatinine, and coagulation profile). The guidance was drawn up based on a review of a total of 24 clinical practice guidelines. However, it is worth noting, that only New Zealand's 2014 guidelines mention routine performance of laboratory tests, urinalysis, and ECG. Other recommendations supports an individualised approach, taking into account chronic diseases and perioperative risk [7]. The high number of tests ordered in Poland may thus be linked to the findings presented in that report.

Laboratory tests, additional examinations, specialist consultations

Haemoglobin, haematocrit (complete blood count)

There is a consensus among scientific societies that a haemoglobin test should be performed preoperatively on a routine basis (major surgery, risk of intraoperative bleeding) in order to prepare the patient better for complications, if any should occur, or pursue further diagnostic workup [8]. Untreated preoperative anaemia is known to prolong hospitalisation and elevate perioperative mortality rates. According to ESAIC guidelines in case of revealing an anaemia, serum iron level should be assessed and treatment of known iron deficiency initiated with intravenous iron supplementation before elective procedures [6].

TABLE 5. Detailed NICE, ASA, and CAS guidelines for different types of laboratory tests

Test	NICE	ASA	CAS
Haemoglobin or haematocrit	ASA 1–4 – yes	Not routinely, consider when: 1) liver disease, 2) extremes of age, 3) history of anaemia, 4) bleeding, 5) other haematological disorders.	Consider when: 1) liver disease, 2) extremes of age, 3) history of anaemia, 4) risk of significant blood loss, 5) haematological disease, 6) malignancy.
Coagulations/haemostasis	ASA 1, 2 – not routinely ASA 3, 4 consider – chronic liver disease	Consider when: 1) bleeding disorders, 2) renal dysfunction, 3) liver dysfunction, 4) relevant type and invasiveness of procedure.	Consider when: 1) history of excessive bleeding, or a family history of heritable coagulopathies 2) oral or parenteral anticoagulant therapy 3) conditions or medications associated with impaired coagulation (e.g., liver disease, malnutrition).
Serum chemistries (i.e., potassium, glucose, sodium, renal and liver function studies)	ASA 1 consider in people at risk of AKI ASA 2–4 – yes	Consideration includes: 1) likely perioperative therapies, 2) endocrine disorders, 3) risk of renal dysfunction, 4) risk of liver dysfunction, 5) use of certain medications or alternative therapies.	Electrolytes – may be considered: 1) pituitary–adrenal disease, 2) complicated diabetes, 3) chronic renal failure, 4) liver disease, 5) hypertension, 6) congestive heart failure, 7) malnutrition, 8) for patients taking diuretics, ACEI, ARB, and other therapy affecting electrolytes. Creatinine and eGFR – may be considered: 1) as above for electrolytes, 2) with advanced age, 3) for patients taking medications potentially affecting renal function, 4) for patients receiving direct oral anticoagulants, 5) as required for calculating perioperative risk indices. Fasting glucose level – may be considered: 1) for diabetics – glycaemic control, 2) for patients on glucocorticoid therapy, 3) as screening for BMI > 40 or very high risk of diabetes based on signs and symptoms.
Urine tests	Not routinely. Only if the presence of a urinary tract infection would influence the decision to operate.	Not indicated except: 1) for specific procedures (e.g., prosthesis implantation, urologic procedures) 2) when urinary tract symptoms are present.	N/A
NT-pro-BNP	N/A	N/A	May be considered if: 1) age > 65 years, 2) age 45–65 years with significant cardiac disease, 3) Revised Cardiac Risk Index score > 1.

Patient blood management (PBM) is wider topic than only screening and treating anaemia. Nowadays experts all over the world emphasize need and importance of implementing cohesive blood management programs in health care systems. The concept involves also i.a. minimizing blood loss, managing coagulopathic bleeding, focusing on preserving a patient's own blood [9]. The crucial issue is shared decision-making, involving patient's perspective [10]. Implementing a PBM program creates opportunity to achieve additional benefits

for patients (such as lower morbidity, mortality and reduced LOS in hospital and the ICU, fewer complications) and optimise transfusion related costs of hospitalisation [11]. PBM was not covered in the survey and should be investigated in a dedicated research.

Coagulation system (APTT, INR)

According to the NICE guidelines coagulation tests are not deemed essential in patients classified as ASA 1-2, regardless of the extent of surgical

TABLE 6. Detailed NICE, ASA, and CAS guidelines for different types of additional examinations

Additional examination	NICE	ASA	CAS
ECG	ASA 1 – consider for people > 65 years if no ECG results available from < 12 months ASA 2–4 – yes	For patient with: 1) cardiocirculatory disease, 2) respiratory disease, 3) relevant type or invasiveness of surgery. ECG may be indicated for patients with known cardiovascular risk factors or for patients with risk factors identified during a pre-anaesthetic evaluation. Age alone may not be an indication for ECG.	May be considered: 1) known or suspected coronary heart disease, 2) significant arrhythmia, 3) peripheral vascular disease, 4) other significant structural heart disease, 5) in the absence of symptoms or known cardiovascular disease in patients having high-risk surgery in the presence of clinical risk factors (e.g., RCRI or ACS).
Spirometry, arterial blood gas	ASA 1, 2 – no ASA 3, 4 – consider seeking advice from a senior anaesthetist as soon as possible after assessment – due to known or suspected respiratory disease	Anaesthesiologists should balance the risks and costs against their benefits. Consideration includes: 1) type and invasiveness of the surgical procedure, 2) interval from previous evaluation, treated or symptomatic asthma, 3) symptomatic COPD, 4) scoliosis with restrictive function.	N/A
Chest X-ray	Not routinely	Not routinely. Consider when: 1) smoking, 2) recent upper respiratory infection, 3) COPD, 4) cardiac disease.	Not recommended routinely for asymptomatic patients unless a surgical or oncological workup unrelated to perioperative risk assessment. Consider when: 1) acute or chronic cardiopulmonary disease if it will change management.
Echocardiography	Not routinely Consider when: 1) heart murmur and any cardiac symptom or 2) signs or symptoms of heart failure.	Anaesthesiologists should balance the risks and costs against their benefits. Consider when: 1) cardiovascular risk factors, 2) relevant type of surgery.	Consider when: 1) undiagnosed severe obstructive intracardiac abnormality, 2) cardiomyopathy or 3) severe pulmonary hypertension.

procedures. In the ASA 3 and 4 groups, coagulation tests should be considered only in patients with concomitant liver diseases. Based on the ASA and CAS guidelines, the performance of these tests should be made conditionally, basing on factors including the type of surgery and its invasiveness. It needs to be highlighted, that anaesthesiologists often need coagulation parameters to determine the optimal type of anaesthesia (central block, regional block).

Biochemical tests

According to the available guidelines, biochemical testing should be considered and specific tests selected depending on the patient profile [4]. The NICE guidelines, which are usually restrictive, prescribe that eGFR, creatinine, urea, and electrolyte tests should be carried out in all ASA 2-4 patients, but in the ASA 1 group only in patients who are at risk of developing AKI [5]. ASA 2 patients are those with chronic conditions, that are well controlled pharmacologically, but their medications may affect

electrolyte levels or impair renal function. The analysis of study findings shows that Polish medical practitioners have a very liberal approach to routine biochemical testing. The vast majority order biochemical tests regardless of whether patients have any comorbidities or not. In addition to generating high costs, this practice may cause undue delay in TKA and THA procedures. Particularly noteworthy observations include high rates of inflammatory marker tests (CRP and ESR) performed in patients without signs of infection. The NICE, ASA and CAS guidelines do not mention these tests, probably because they are regarded as unwarranted in patients showing no clinical signs of infection (elective procedures). The position of orthopaedists is presented in the expert consensus statement [12] 'Implantation of joint prosthesis in patients with active inflammation should be deferred until complete healing confirmed by laboratory tests'. Consequently, negative history of active inflammation is not an indication for routine CRP or ESR tests.

Troponin and NT-proBNP tests

In Poland, these tests are not performed on a routine basis. According to the CAS guidelines, they should be considered in patients aged over 65 years or presenting with major cardiac diseases. ESC 2022 guidelines change the recommendation class to I for high-sensitivity troponin testing before intermediate or high-risk surgical procedures and 24 hours and 48 hours after surgery in patients with cardiovascular disease [8].

Urinalysis

The NICE and ASA guidelines clearly identify patients presenting with symptoms of urinary tract infection, as the only group benefiting from the urine test. Screening for asymptomatic bacteriuria causes an unwarranted delay in performing surgery, and leads to further tests (microbiology, CRP, procalcitonin) and unnecessary antibiotic therapy, which has a direct impact on the development of antibiotic-resistant bacteria and increases the costs. According to the available evidence, in the population of women over 80 years of age, one in 10 has asymptomatic bacteriuria [13]. Orthopaedists agree that urinalysis should not be performed on an obligatory basis, but be reserved for patients with active or history of urinary tract infection [12].

Additional examinations

Similarly to the 2022 ESC guidance, anaesthesiology guidelines unequivocally endorse ECG screening in patients with cardiac diseases or cardiovascular risk factors. In ASA 1 patients, NICE and ESC experts additionally recommend ECG in patients over 65 years of age. With respect to chest X-ray, the guidelines do not advise routine imaging examinations, restricting them to patients with respiratory or cardiovascular conditions.

Specialist consultations

Experts agree, that specialist consultations should only be carried out if the benefits outweigh the risks associated with delaying the procedure and additional costs. In fact, there are two situations to be considered in this context: diagnosis of a new disease or inadequate control of an existing medical condition. In Poland, specialist consultations are ordered far too often, particularly by orthopaedists (only 21% **do not** refer patients for any consultations on a routine basis).

Prehabilitation

Prehabilitation refers to all interventions performed prior to surgery in order to improve patients' health status and physical performance, reduce perioperative mortality and accelerate recovery.

In 2021 findings of a systematic review and meta-analysis were published in BMJ, which identified four interventions reducing the length of stay (LOS) and the rate of postoperative complications: immunomodulatory nutrition, breathing exercises, general fitness exercises, and multimodal prehabilitation. The authors of the review highlighted that prehabilitation was safe, and no adverse effects of these interventions were reported in any study [14]. It should be noted that worldwide, in several health care systems prehabilitation is a permanent element of perioperative care, whereas in Polish health care system it is not centrally provided- patients have no access to any structured education and rehabilitation program other than local initiatives.

Asymptomatic bacteriuria

There is scientific evidence both for [15, 16] and against a correlation between asymptomatic bacteriuria and implant infection [17, 18]. A 2018 metaanalysis found no such association [15]. To date, antibiotic therapy has not been proven to be of value in reducing implant infections following treatment of asymptomatic bacteriuria [14]. On the other hand, according to orthopaedic practice guidelines, patients with asymptomatic bacteriuria can be operated on safely, provided that they receive perioperative antibiotic prophylaxis, which is routine in all cases [12].

Protocols

The application of standardised perioperative intervention protocols aims to reduce patients' LOS and the rate of complications, including postoperative mortality [19-21]. At present, the most widely used care protocol is ERAS (Enhanced Recovery After Surgery). In 2020 took place a publication of the findings from a multicentre, prospective observational study assessing the relationship between the use of the ERAS care protocol and postoperative complications after elective TKA and THA procedures. The application of the protocol was shown to reduce the rate of postoperative complications. Moreover, specific interventions of the greatest importance were identified, including the use of regional or local anaesthesia, appropriate management of anaemia and bleeding, and early mobilisation of patients. The study also found that not all the principles of the protocol were properly adhered to, even in units that recognise themselves as ERAS-compliant [22]. In addition, achieving the benefits of the protocol requires cooperation between medical team members and the patient [21]. In Poland, paradoxically, more examinations and consultations are ordered by medical practitioners following the procedures. Therefore, a ques-

tion arises as to what standardised protocols are in place and whether they are being implemented adequately.

Fast-track TKA and THA procedures

Increasing social expectations to reduce the LOS while maintaining the safety and quality of patient care open up new directions for changes. Prospective scientific studies provide evidence for the safety and efficacy of fast-track programs [23, 24]. In 2020 Drosos *et al.* published a retrospective analysis of data collected prospectively for 434 patients undergoing TKA and THA procedures. The paper outlined a three-step process of modification of perioperative procedures, including step I – physiotherapy, step II – blood transfusion program, step III – multimodal pain management [25]. Each stage lasted nine months, with new regimens successively implemented and further components added. The literature data demonstrated clear medical, social and financial benefits, indicating the need to reorganise work [23, 24, 26].

Same-day TKA and THA procedures are performed in only four hospitals in Poland. Effective and safe modernisation of the Polish perioperative care system requires careful planning and training of medical professionals, followed by stepwise implementation, while allocating an appropriate amount of time for adaptation.

Preanaesthetic evaluation before TKA and THA

Studies available in the literature show the benefits of early assessment of patients in anaesthesia clinics. Preoperative anaesthesiology assessment should be multidisciplinary and planned in advance adequately prior to scheduled surgery, in order to optimise chronic conditions e.g. iron deficiency [8]. Research has demonstrated a decreased number of cases of patient's ineligibility for procedure on the scheduled surgery date [27], reduced LOS and lower costs of care [28]. Blitz *et al.* [29] reported lower perioperative mortality in the group of patients assessed for eligibility for surgery in an anaesthesia outpatient clinic. Research findings are incorporated into guidelines issued by scientific societies (as summarised in Table S4).

In Poland, according to the Regulation of the Minister of Health, which has been in force since 2016, preanaesthesia evaluation should be carried out at least 24 hours before scheduled anaesthesia [30].

LIMITATIONS

As we approach the responders in several possible ways to increase the response rate, we do not know the exact denominator of studied group. It should be noted, that the response rate in the orthopaedic group was lower than in anaesthesi-

ologists group. There was also no prior sample size calculation performed as we planned the study to have exploratory character. Concerning the questionnaire, PMB was not covered in the survey. In authors' opinion it was impossible to fulfil complex PBM aspects in a comprehensive way in this questionnaire and keep it concise at the same time.

CONCLUSIONS

The survey helped to identify elements of preoperative care which should be modified to improve the safety and quality of TKA and THA procedures. The following conclusions were reached:

- laboratory tests should be individualised depending on the patient's disease profile;
- tests including urinalysis, CRP, ESR and glucose should not be ordered on a routine basis;
- PBM is prominent part of preoperative preparation. This area requires further investigation in Poland and should assume growing importance;
- ECG and chest X-ray should be individualised depending on the patient's disease profile;
- patients should not be referred for specialist consultations if their chronic disease is stable;
- preoperative rehabilitation and education should be provided to patients in a standardised and systematic manner;
- standardised surgical protocols should be applied with due diligence. In case of difficulties with their full implementation, the implementation of their major components should be pursued;
- fast-track TKA and THA procedures are both safe and effective;
- the number of patients undergoing preanesthetic evaluation before elective procedures in an anaesthesia outpatient clinic should be increased;
- cooperation between anaesthetic and surgical teams is fundamental to the quality and safety of patient hospitalisation.

The conclusion arising from the study results' analysis is that perioperative care in Poland needs standardisation, in a form of formally binding guidelines or recommendations.

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