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Polish translation of the Anatomical Quality Assurance (AQUA) Checklist: new guidelines for reporting in original anatomical studies

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Abstract: Recently, an improvement of the quality of reporting and methodology in original research has been observed. Major fields in research have introduced checklists aimed at promoting clear and univocal reporting of methods and results. The basis of evidence-based medicine (EBM) lies in transparent reporting of primary studies. Although clinical research progressed rapidly into evidence-based guidelines, the basic sciences, including anatomy, just recently started to use the rules of EBM. No anatomy-specific standardized research checklist has been introduced so far. Evidence-based anatomy (EBA) emerged as a new approach to research in anatomy that incorporates methods, such as meta-analysis and systematic review. High quality methodology and clear reporting of results of original studies are the basis of EBA. The Anatomical Quality Assurance (AQUA) Checklist is a new tool aimed to introduce univocal reporting of original anatomical studies. The checklist consists of 29 reporting items, which are essential in obtaining unambiguous and high-quality reporting of methods and results and ensuing straightforward interpretation and reproducibility. The AQUA Checklists been endorsed by anatomical associations, including the International Federation of Associations of Anatomists. Therefore, the authors of this study believe that introduction of the Polish version of AQUA Checklist into practice will im-

prove the quality of original anatomical studies in Poland and will promote the EBA standards for years to come.

Key words: evidence based anatomy, Anatomical Quality Assurance, AQUA, checklist.

Introduction

The bases of anatomy as a field of research are well-established. Despite this fact, anatomy has progressed rapidly in recent years. The advancement of surgical sciences, dissection, imaging and electrophysiological techniques enabled to incorporate new methodology and acquire new anatomical knowledge. However, there is still a need for a tool to make anatomical research more precise, reproducible and clinically-applicable.

Anatomy has recently advanced into the evidence-based medicine (EBM) era [1]. The use of systematic reviews and meta-analyses will enable to obtain high-quality results, making anatomy an even more accurate and reliable field, applicable to clinical practice [1]. As evidence-based anatomy (EBA) develops, there is a pressing need for proper standards of reporting of original anatomical studies. This would enable systematic and conscious assessment of the quality of methodology and results of particular studies, allowing for easier application of anatomical knowledge by clinicians.

The use of reporting guidelines would facilitate transparency and reproducibility in anatomical research. Other fields have incorporated multiple checklists, such as the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) [2], the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [3] and the Consolidated Standards of Reporting Trials (CONSORT) [4], which allowed to improve the quality of reporting in clinical trials, observational studies and meta-analyses and systematic reviews. However, the field of anatomy lacked reporting checklists and guidelines. As such, the Anatomical Quality Assurance (AQUA) Checklist [5] was introduced to fill the urgent void. Through the evidence-based approach [6–8], AQUA Steering Committee has shown that some of original anatomical studies lacked proper quality of methodology and reporting, therefore raising the risk of bias and lower reproducibility. The checklist consists of 29 reporting items, which should be addressed by the authors of original anatomical studies (cadaveric, imaging, electrophysiological etc.). The checklist ensures unambiguous and high quality reporting of methods and results and therefore straightforward interpretation and reproducibility. It allows clinicians to use more precise data for their practice as well as introduces the basis of EBA for future studies.

The formation of a steering committee initiated the work on the AQUA Checklist in 2015. The members of the committee had broad prior experience in original and evidence-based research [9–13]. The initial work consisted of systematic analysis of literature and resulted in inclusion of standard items used in biomedical research (sample size, demographics, results, etc.). Then, the AQUA Steering Committee selected a series of items that, from Committee's experience, were usually deficient in anatomical studies (study design, sample size, type of calculations). This was followed by inclusion of items specific to original anatomical research, such as elements of descriptive anatomy or unique techniques and tools. The checklist received numerous feedback from renown specialists in the field of anatomy, including editors-in-chief of journals like *Clinical Anatomy* and *Surgical and Radiological Anatomy* and the editor of *Gray's Anatomy*. The informative suggestions, along with two rounds of a Delphi protocol, properly assessed, refined and validated the checklist until the final version was created. The process of development of AQUA Checklist is presented in Fig. 1. The AQUA Checklist is registered with the Enhancing the Quality and Transparency of Health Research (EQUATOR) Network and has been endorsed by anatomical associations, including the International Federation of Associations of Anatomists.

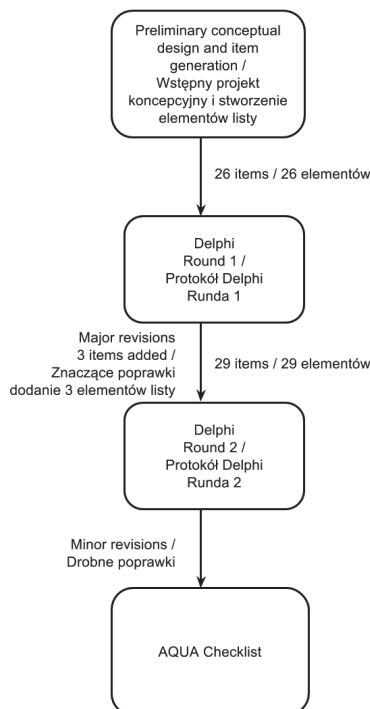


Fig. 1. The process of development of AQUA Checklist.

The aim of this study was to develop a Polish translation of AQUA Checklist. We believe that the Polish translation of the AQUA Checklist will allow for more transparent, clearer and more effective reporting of anatomical studies in this language. The use and adherence to the Polish AQUA Checklist will supplement regional journals and will present Polish researchers with a tool for better understanding of original anatomical research and its clinical applicability in their native language.

Methods

The AQUA Steering Committee granted permission for translation of AQUA Checklist into Polish in October, 2016. A team was formed for the purpose of translation of AQUA Checklist and comprised of medical professionals fluent both in English and Polish. The translators were of Polish background, but had at least 12 month of experience of living in an English-speaking country. The Steering Committee confirmed that the translators were fully aware of principles and guidelines of AQUA Checklist and understood the needs of Polish readers before granting the permission for translation.

The translation of AQUA Checklist into Polish was a two-step procedure, conducted according to AQUA translation policy and guidelines. The initial translation to Polish was conducted. Then, a translator blinded to the original AQUA Checklist, translated the checklist backward to English. The backward translation was sent to the Steering Committee for verification. The Steering Committee suggested modifications and the forward and backward translation process was repeated until full approval from the Steering Committee was granted.

Results

The initial forward-backward translation process of the AQUA Checklist resulted in minor discrepancies. Following the suggestions of AQUA Steering Committee, a second and third round of translations resulted in only minor grammatical issues, resolved by the final translation process. The Polish translation of the AQUA Checklist is presented in Table 1 and in official formatting in Supplement 1.

How to use the AQUA Checklist

The Polish version of AQUA Checklist was created to aid authors in planning and reporting original anatomical research in the most thorough and accurate way. It is not, however, a substitute for journal's specific author guidelines, but rather a set of instructions that ensure both clear reporting and easy reproducibility.

Twenty nine items divided into eight sections, including Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusions and Other Information, form the AQUA Checklist and are presented in Table 1. The AQUA team suggest consulting the AQUA Checklist before, during and after the manuscript drafting process. The authors of original anatomical research should consult the AQUA Checklist while deciding on the structure of the manuscript. After completion of the draft of the manuscript, the authors should review if any of 29 items are missing and adjust them accordingly. Then, the authors should complete the AQUA Checklist by filling out page numbers of the manuscript in the corresponding item's location on the checklist. Any items that are not applicable to a particular study, may be filled out with "NA" (Not Applicable). Completed checklist should be submitted along with the manuscript as a supplement. The author's should cite the original AQUA Checklist publication [5] or this Polish translation study. The translated and original AQUA Checklist can be accessed freely on the International Evidence-Based Anatomy Working Group's AQUA Website (<http://www.eba.cm.uj.edu.pl/aqua>).

Discussion

The Steering Committee has observed a wide range of disproportion in the quality of reporting of anatomical data through an extensive number of meta-analyses and systematic reviews [14–18]. Many studies report deficient and unclear methodology and results, thus preventing accessible anatomical knowledge for clinical-applicability or study-reproducibility. Poor methodological design of the study may result in incorrect interpretation of the results and false suggestions for clinical practice. Poor reporting of the anatomical study does not always imply poor methodology, yet flaws in reporting impede proper study quality assessment, especially relevant for reviewers involved in peer-review process. On the other hand, high quality methodology and reporting of anatomical data can improve clinical practice and prevent iatrogenic injuries during surgical procedures. Therefore, in order to address these issues, the AQUA Checklist was created and validated.

An international incorporation of AQUA Checklist into anatomical research can ensure unambiguous and transparent reporting of anatomical data and can enhance study design and conduction process. It can aid in identification of new anatomical areas that require further research. As the reproducibility of a study is one of the hallmarks of high quality of methodology and reporting, the AQUA Checklist will aid the researchers through a simplified process.

Few points concerning AQUA Checklist should be addressed. Firstly, the checklist has not been developed to replace journal's specific author guidelines, but rather as an aid for conducting anatomical research of high quality. Moreover, it should not be

used as a tool for assessing the quality of anatomic research. The Steering Committee has created a specific tool for this purpose — the Anatomical Quality Assessment (AQUA) Tool [19] aimed specifically to assess the quality and reliability of anatomical studies using a formal consensus method [19]. Lastly, the Steering Committee would like to emphasize that the AQUA Checklist has been formed by and for scientific body, thus we welcome any feedback that can aid in further development of this tool.

Conclusions

The Polish version of the AQUA Checklist will remove any language barriers and improve the quality of reporting of anatomical research published in Polish journals. The incorporation of AQUA Checklist will allow for more transparent presentation of anatomical data and as such ensue reproducibility and applicability of Polish anatomical research by both Polish, as well as international scientists and clinicians, alike.

Conflict of interest

None declared.

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Supplement 1

Table 1. List of items with their descriptions and recommendations as included in the final version of the AQUA Checklist.

Checklist Component	#	Description and Recommendation
Title / Tytuł		
Title	1	Identify the main objective or key characteristic of the study in the title.
Tytuł		Określ główny cel i krótko scharakteryzuj najważniejsze cechy badania.
Abstract / Streszczenie		
Structured Summary	2	Provide a clear and structured summary of the study with emphasis on the aims, methodology, key findings, and conclusions directly supported by study findings.
Podsumowanie		Sporządź zrozumiałe i ustrukturyzowane podsumowanie badania, uwzględniając jego cele, metodologię, najważniejsze wyniki oraz pochodzące z nich wnioski.
Introduction / Wstęp		
Background / Rationale	3	Provide a rationale for the study including a concise, updated scientific background, appropriately referenced. Identify any relevant knowledge gaps to support the study rationale.
Tło / celowość podjęcia badania		Określ celowość badania, uwzględniając najnowszą wiedzę pochodzącą z piśmiennictwa naukowego dotyczącego badanego tematu oraz zidentyfikuj jego istotne aspekty, które wymagają lepszego niż do tej pory przeanalizowania.
Objective	4	Indicate clearly the main objective(s) of the study, and state any hypotheses to be tested.
Cel		Wskaż jasno główne cele badania i przedstaw hipotezy badawcze, których prawdziwość będziesz oceniał.
Methodology / Metodyka		
Study Design and Fundamentals	5	Provide precise details with respect to the design and fundamentals of the study, including but not limited to the following: 1. Study design: prospective, retrospective, cross-sectional, etc. 2. Study type: cadaveric (e.g. formalin fixed or fresh frozen), imaging, intraoperative, etc.
Typ badania		Dostarcz precyzyjnych informacji na temat badania, na które składają się m.in.: 1. Typ badania: prospektywne, retrospektywne, przekrojowe itd.

	2. Rodzaj obserwacji: przeprowadzone na zwłokach (np. utrwalone w formalinie, świeżo mrożone), badania obrazowe, badania śródoperacyjne, itd.
Setting	6 Describe clearly the location where the study was conducted and dates (month/year) between which the data were collected.
Miejsce i czas wykonania badania	Opisz w przejrzysty sposób miejsce wykonania badania oraz przedział czasowy, w którym zostało ono przeprowadzone.
Sample Size	7 When appropriate, statistical power analysis should be used to calculate sample size or effect size. If relevant, justification for the study sample size should be briefly stated.
Liczebność grupy badanej	By obliczyć minimalną liczebność grupy badanej przeprowadź analizę siły statystycznej. Kiedy to konieczne, opisz dodatkowe powody, dla których badanie zostało przeprowadzone na grupie badanej o określonej liczebności.
Subjects	8 Define clearly the eligibility criteria and methods of subject selection and inclusion, with details of the baseline and demographic selection criteria of the subjects (age, sex, healthy or diseased, etc.) included in the study.
Obiekty badań	Zdefiniuj precyzyjnie metody selekcji (kryteria włączenia i wyłączenia z badania) obiektów, na których przeprowadzone zostało badanie. Określ ich charakterystykę demograficzną (wiek, płeć, stan zdrowia itd.).
Reference Standard	9 Define clearly and accurately all anatomical definitions (normal anatomy, variations, classifications, etc.) by which data will be collected, analyzed, and compared. Citations should be included when appropriate.
Standard odniesienia	Opisz dokładnie wszystkie pojęcia anatomiczne (anatomię prawidłową, warianty anatomiczne, klasyfikacje, itd.), zgodnie z którymi opisywane będą wyniki badania. Dostarcz informacji dotyczących literatury naukowej na podstawie której oparłeś swój opis.
Outcomes and/or Parameters	10 Define clearly the outcomes and parameters (e.g. prevalence of a variation, mean length and diameter of a structure, etc.) assessed in the study. When present, confounders should be clearly stated.
Rezultaty oraz parametry	Zdefiniuj w przejrzysty sposób rezultaty oraz parametry (częstość występowania określonego wariantu anatomicznego, średnią długość bądź średnicę struktury anatomicznej) jakie będą oceniane w badaniu. Jeśli występują czynniki mogące zaburzyć interpretację wyników, powinny zostać szczegółowo opisane.

Table 1. Cont.

Checklist Component	#	Description and Recommendation
Measurement and Assessment	11	Indicate clearly the group of subjects included in each measurement/assessment (source of data). Provide clear details about the methods of measurement/assessment of each outcome and/or parameter (e.g. reference points for length measurements, internal or external diameter, etc.). Opisz precyzyjnie grupy obiektów, na jakich przeprowadzone zostały poszczególne pomiary. Dostarcz szczegółowych informacji na temat metodyki wszystkich wykonanych pomiarów (np. punkty odniesienia dla pomiarów długości).
Modality	12	Describe clearly the materials, equipment, and instruments used (with manufacturer/supplier details) to conduct the specific study design. Opisz precyzyjnie użyte w badaniu materiały oraz narzędzia. Dostarcz informacji na temat ich producenta/dostawcy.
Technique	13	Describe precisely the methods (e.g. dissection technique, image reconstruction, etc.) applied in the study to allow for reproducibility. Relevant details (profession, years of experience) regarding the individual(s) performing the technical aspect of the study are recommended.
Technika		Opisz precyzyjnie metody (np. technikę preparatyki anatomicznej, rekonstrukcji obrazu itd.) wykorzystane w badaniu, aby umożliwić jego odtworzenie. Dostarcz informacji (wykonywany zawód, lata doświadczenia) na temat osób, które przeprowadzały doświadczenie naukowe.
Bias	14	Identify any potential source of bias and, when present, describe measures implemented to assess the risk of bias.
Źródła błędu (bias)		Oceń potencjalne źródła błędu oraz opisz środki, za pomocą których określiłeś ryzyko błędu.
Statistical Approach	15	Describe all statistical methods for analyzing the data, including those of confounders. Statistical methods for additional analyses (e.g. subgroup/sensitivity analyses), when performed, should be described.
Analiza statystyczna		Opisz wszystkie metody statystyczne, którymi posłużyłeś się podczas analizy zebranych danych (włączając analizę czynników zakłócających), również te wykorzystane w dodatkowych analizach (np. podgrup, analizach czułości).
Ethics	16	Provide the details of compliance with ethical guidelines, including the name of the review board or agency, approval number, and date. AQUA endorses the Helsinki Declaration and its later amendments. When appropriate, details of written, informed consent should be clearly stated.

Etyka	Dostarcz informacji na temat zgodności badania z zasadami etyki, podaj nazwę komisji bioetycznej, która wydała zgodę na przeprowadzenie badania, numer zgody oraz datę jej wystawienia. Zalecamy, by standardy postępowania były w zgodzie z Deklaracją Helsińską. Gdy to konieczne, podaj informacje na temat pisemnej, świadomej zgody dawcy bądź jego rodziny.	
Results / Wyniki		
Subjects	17	Report the numbers of subjects included in the study, including data on their baseline and demographic characteristics. When needed, provide reason(s) and data on characteristics of the subjects excluded from the study at any stage. Przedstaw liczbę obiektów ujętych w badaniu oraz ich charakterystykę (uwzględniając demografię). Jeśli na jakimkolwiek etapie badania dokonales wykluczenia pewnych obiektów z dalszej analizy, scharakteryzuj je oraz wyjaśnij powód.
Pacjenci/Preparaty/ Obiekty		
Main Results	18	Provide unaltered/non-manipulated summary data (number [percentage]) or estimates (with confidence intervals and values of consistency when applicable) from the analyses performed. Tabular presentation of the results is highly recommended. Na podstawie przeprowadzonych analiz podaj niezmiennione dane w formie podsumowania (liczba [procent]) lub szacunku (z przedziałami ufności i wynikami odpowiednich testów statystycznych potwierdzającymi spójność danych). Zalecane jest przedstawienie danych liczbowych w postaci tabel.
Główne wyniki		
Descriptive Anatomy	19	Present clear and comprehensible figures (i.e. images, illustrations, diagrams, etc.), labeled as appropriate, to explain the results where needed AND describe clearly any anatomical findings that could be ambiguous, questionable, or atypical. New classifications of anatomical variations should be complemented by representative figures and corresponding dissection/imaging photographs. Przedstaw przejrzyste, wyczerpujące ryciny (np. zdjęcia, ilustracje, wykresy) oraz zamieść ich dokładny opis. Opisz zrozumiale wszystkie struktury anatomiczne, które mogą być odebrane jako dwuznaczne lub atypowe. Nowe klasyfikacje wariantów anatomicznych wzbogać odpowiednimi rycinami (schematami, fotografiami preparatów anatomicznych i/lub zdjęciami radiologicznymi).
Anatomia opisowa		
Confounders	20	Present precise data from assessment/measurement of confounders, if any. Dostarcz dokładne dane na temat oceny/pomiarów czynników zakłócających wyniki badania.
Czynniki zakłócające wyniki badania		

Table 1. Cont.

Checklist Component	#	Description and Recommendation
Additional analyses	21	Provide clear results of additional analyses (e.g. subgroup/sensitivity analyses), if performed. Tabular presentation of the results is highly recommended.
Dodatkowe analizy		Jeśli w badaniu wykonałeś dodatkowe analizy (np. analizy podgrup, czułości), przedstaw szczegółowo ich wyniki, najlepiej w postaci tabel.
Discussion / Dyskusja		
Key Findings	22	Include summary of key evidence/findings from the study pertaining to the rationale/objectives of the study. No new study results should be presented in the discussion.
Najważniejsze wyniki		Podsumuj najważniejsze wyniki Twojego badania w odniesieniu do postawionych wcześniej celów. Wszystkie rezultaty omawiane w dyskusji powinny być uprzednio opisane w „Wynikach” (nie wprowadzaj nowych wyników w dyskusji).
Interpretation and Comparison(s)	23	Provide comprehensive (but judicious) interpretation of the results from the study, and comparison and/or reference to the results from other studies on the topic, appropriately cited. Meaningful clinical impact/significance of the findings from the study should be discussed where relevant.
Interpretacja i porównanie		Dostarcz wyczerpującą, a zarazem wyważoną, interpretację wyników badania oraz porównanie i/lub odniesienie do wyników pochodzących z innych badań poruszających dany temat. Omów kliniczne znaczenie najbardziej istotnych rezultatów Twojego badania.
Implication(s)	24	State briefly the implications of the findings or potential areas of the study that require further research.
Implikacje dla rozwoju nauki		Scharakteryzuj pokrótce jak wyniki badania wpływają na rozwój nauki oraz określ jego potencjalne elementy, które wymagają potwierdzenia w toku dalszych badań.
Limitation(s)	25	Discuss briefly limitations of the study at any stage, including risk of bias, potential confounders, or intraobserver and/or interobserver variability.
Ograniczenia		Omów zwięźle ograniczenia poszczególnych części badania, m.in.: ryzyko błędu, czynniki zakłócające, różnice między wynikami różnych badaczy w ramach tej samej metodologii badania.
Conclusions / Wnioski		
Summary	26	Summarize the key information (i.e. “take-home message”) directly supported by the findings/evidence from the study.

Podsumowanie	Podkreśl najważniejsze informacje, które czytelnik powinien zapamiętać po przeczytaniu wyników badania.	
Other Information / Dodatkowe informacje		
Acknowledgement Podziękowania	27	Acknowledge individual(s), institution(s), or third parties who significantly contributed to the study. Podziękuj wszystkim osobom oraz podmiotom prawnym, które przyczyniły się do powstania badania.
Conflict of interest Konflikt interesów	28	Disclose any conflicts of interests related to the study for all contributing authors. Opisz istnienie lub brak istnienia konfliktu interesów związanego z uczestnictwem w badaniu poszczególnych autorów.
Funding Finansowanie	29	Describe sources of funding for the study and any other support. Dostarcz informacji na temat pochodzenia środków finansowych dzięki którym przeprowadzone zostało badanie.