

## Quality criteria for medical informatics research papers

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The following checklist of quality criteria for medical informatics research papers was developed by the Editors and Managing Editors of the Yearbook of Medical Informatics of the International Medical Informatics Association (IMIA) to support the production of the annual IMIA Yearbooks.

It can freely be used by anyone interested in it. The most recent version is available at <http://iig.umat.at/yearbook>. We would very much appreciate any comments and suggestions on this checklist.

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<i>Categories and Quality Criteria</i>	-	-/+	+
<b>A Significance</b>			
<b>A1 Topic's importance to medical and health informatics</b>			
Is the topic current and significant?			
Is the topic interesting for the medical informatics research community? Does the topic have the potential to increase the scientific knowledge in medical informatics? Does the topic have the potential to improve patient care?			
<b>A2 Scientific impact of the paper on the topic</b>			
Does the paper address a relevant research problem with relevance to patient care or medical informatics?			
Is the paper, and are its results, scientifically credible?			
Is the paper of interest for the medical informatics research community? Does the paper contain an increase in scientific knowledge for the given topic? Does the paper have a potential impact on patient care? Can the results be transferred to similar questions or situations?			
<b>B Quality of scientific content</b>			
<b>B1 General criteria</b>			
Do the authors have a prior track record or reputation in research on this topic?			
Is the number of the authors adequate for the content of the paper?			
Is the journal in which the paper has been published a peer-reviewed journal with expertise in paper's topic?			
Are the keywords representative for the topic?			
Are the institutions funding the research, and other contributors, credited?			
Are any potential conflicts of interests indicated?			
<b>B2 Background and motivation</b>			
Is the relevance of the paper made clear?			
Is the motivation of the work in context with previous research?			
<b>B3 Purpose of the paper</b>			
Are the aims of the paper and the research questions presented clearly and unambiguously?			
Do the aims and the research questions make sense in the context of the given topic?			
<b>B4 Method and approach</b>			
Is the chosen method and approach presented clearly and unambiguously? Is the given information sufficient to reproduce the method or approach?			
Is the chosen method and approach placed in context with other possible methods and approaches? Is it explained why this specific method and approach was chosen over others?			
Is the method and approach suited to answer the research questions?			
<b>B5 Presentation of results</b>			
Are the results presented clearly and unambiguously?			
Is it clear how, and from where, the results have been derived?			
Are objective results and subjective interpretations distinguished clearly?			
Do the results answer the initial research questions?			
<b>B6 Discussion</b>			
Is the discussion been formulated clearly and unambiguously?			
Are facts, conclusions and opinions been separated clearly?			
Are own results critically assessed? Have negative data or apparently contradictory results been discussed or explained? Have the limitations of the method and results been discussed? Are the results discussed in the context of other recent research?			
Is the significance of the results discussed?			

<i>Categories and Quality Criteria</i>	-	-/+	+
Has the generalization of the results been discussed?			
Have the implications of the results for patient care or medical informatics research been discussed?			
<b>B7 Conclusion</b>			
Does the conclusion contain a short statement of findings and conclusions?			
Can the conclusions really be derived from the presented results?			
Have new and important aspects of the work been emphasized?			
Are the implications for future research, or for patient care, discussed?			
<b>B8 Additional criteria for specific types of papers</b>			
<i>Additional criteria for empirical investigations</i>			
Is the chosen study design clear?			
Is the chosen study design adequate to answer the study questions?			
Is the sampling strategy clear and appropriate?			
Is the control group clear and appropriate?			
Is the intervention clear?			
Are the outcome measures clear and appropriate?			
Are data collection and analysis methods clear?			
Are data collection and analysis methods adequate?			
Have sufficient amounts of raw data been presented?			
Can the study be repeated based on the given facts?			
<i>Additional criteria for qualitative research articles</i>			
Is the theoretical framework clear and appropriate?			
Are the methods of fieldwork clear and appropriate?			
Is the sampling strategy clear and appropriate?			
Are the qualitative data collection and analysis methods clear and appropriate?			
Is original raw data sufficiently presented?			
Is the reliability and validity of the results sufficiently addressed?			
Is discussed whether the results can be generalized?			
<i>Additional criteria for methodological articles</i>			
Is it clear why a new methodology (model, framework, technique) is necessary?			
Is the development and formulation of the new method clear and reproducible?			
Are mathematical formulas adequately explained?			
Can other researchers, based on the particular paper, reuse the methods?			
Has the method been validated in a real application?			
<i>Additional criteria for application reports</i>			
Have the objectives of the system (technical system, application, procedure) been made clear?			
Is it clear which problem the system should solve?			
Have the overall architecture and the user functions of the system been presented in sufficient detail?			
Is the environment in which the system is being developed or tested addressed in sufficient detail?			
Has the system been used in a realistic (clinical) environment?			
Have the experiences and effects of the system been derived in a systematic way?			
Have performance and utilization measures been presented?			
Have the effects been compared with the initial design objectives of the system?			
Is the application or approach still being used in routine?			
Are the lessons learned useful to others?			
<i>Addition criteria for systematic reviews</i>			
Is the area of review clearly defined?			
Has locating, selecting and extracting papers for review been defined clearly and reproducibly?			
Are the included papers current?			
Is the review based on a careful, international and longitudinal analysis of the available			

<i>Categories and Quality Criteria</i>	-	-/+	+
literature?			
Does the review possess adequate depth and diversity?			
Have interesting conclusions and perspectives been presented and discussed?			
Is the discussion of different findings well-balanced?			
<b><i>Additional criteria for seminal and viewpoint papers</i></b>			
Is the paper based on long-term theoretical and practical experiences in a given area?			
Do the authors have a clear thesis or opinion?			
Are the presented opinions reasonable and interesting to others?			
Is it clear how the papers relates to prior research?			
Are the facts presented correctly?			
Does the article promote discussion and present initiatives?			
<b>C Originality and innovativeness</b>			
Is the research question, the chosen approach, or the results new and specific?			
Has a new technology, method or approach been used to enhance a proven one?			
Has a proven technology, method or approach been applied to a new domain?			
Has a new technology, method or approach been developed and presented?			
Does the work present new ways to improve patient care, or to increase scientific knowledge?			
Does the work add enough to what is already available in published literature?			
Have the approach and results been reported on previously?			
<b>D Coverage of related literature</b>			
<b>D1 References</b>			
Are the references sufficiently comprehensive for the given topic?			
Do the references sufficiently reflect international research?			
Are the references up to date?			
Do the references comprise only a limited number of papers of the own working group or department?			
Do the references contain sufficient information to find them?			
Do the references comprise only a limited number of 'in press' and 'personal communication' papers?			
<b>E Organization and clarity of the presentation</b>			
<b>E1 Organization the of abstract</b>			
Has the abstract been structured clearly?			
Does the abstract briefly state the relevance, aims, questions, methods, results and conclusions of the paper?			
Is the abstract adequate in length?			
Is the data presented in the abstract consistent with results and conclusions presented in the body of the paper?			
<b>E2 Organization of the paper</b>			
Is the title clear and understandable?			
Is the structure of the article clear and adequate for the content?			
Is the presentation precise and adequate without unnecessary repetition or irrelevant parts?			
Is the length of the article adequate for the topic and its significance?			
Are the sections of the article adequately long?			
Are all figures and tables understandable?			
Is the combination of text and figures/tables well-balanced?			
Is only useful figure and table data repeated in the text?			
Are there discrepancies between text, figures and tables?			
Have all abbreviations been explained sufficiently?			