

## Editorial

## Applied Clinical Informatics Journal: A Brief History

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Appl Clin Inform 2022;13:516–520.

**Abstract****Keywords**

- ▶ *Applied Clinical Informatics*
- ▶ publishing
- ▶ scholarly communication
- ▶ clinical informatics
- ▶ workforce
- ▶ implementation
- ▶ electronic health record

In 2009, Schattauer Verlag in Stuttgart, Germany first published the *Applied Clinical Informatics (ACI)* Journal. *ACI* has served since its inception as an official journal of the International Medical Informatics Association. Later, the American Medical Informatics Association and the European Federation for Medical Informatics named *ACI* as an official journal. This manuscript describes the history of the journal from its inception to present day including publication measures, challenges, and successes.

**Introduction**

This manuscript was solicited in 2017 originally for the International Medical Informatics Association's (IMIA) History project.<sup>1</sup> The intent was to provide details on the history of the *Applied Clinical Informatics (ACI)* journal—an official IMIA journal—before the individuals involved in its inception and development retired and the details were lost.

While *ACI* generally does not publish historical perspectives, the article was transferred to *ACI* to allow readers to place the journal in its historical context, to explore the factors required for the birth of a new journal, to appreciate the serendipitous factors that made the journal possible, and to pay tribute to many of the individuals whose efforts led to

this journal *ACI*. In this article, we seek to span the entire period from recognition of the need for a new applied journal to the current state including data on recent journal measures from submissions to publications.

**Path Toward Creating a New Journal****Demand for a New Journal**

Although the biomedical informatics field had multiple strong journals, by the early 2000s it had become obvious to several clinical informatics researchers and developers—including the authors—that applied clinical informaticians had difficulty finding a dedicated home for their work in established journals. Frequently, applied papers were

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Rüdigerstraße 14,  
70469 Stuttgart, Germany

DOI <https://doi.org/10.1055/s-0042-1749165>.  
ISSN 1869-0327.

rejected because they were not advancing the theory of the field or were deemed to be outside the editorial scope of the journal. As a result many clinical informaticians resorted to publishing in clinical journals<sup>2-4</sup> or in their informatics societies' proceedings.<sup>5-7</sup> Thus, the need for a new applied clinical informatics journal had become apparent. In addition, interest in the domain grew dramatically with the \$29 billion financial stimulus provided through the United States' 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act.<sup>8</sup> Health care in America today represents 19.7% of the U.S. gross domestic product,<sup>9</sup> and the rapid adoption of electronic records increased the need and desire to publish more applied manuscripts about the successes and failures of health information technology (IT).

### A Serendipitous Start

In 2007 during IMIA's MedInfo conference in Brisbane, Australia, Christoph U. (Chris) Lehmann was invited to a meeting with IMIA board members, where Marion Ball articulated what others had already perceived: it was time for a new journal focused on the applied aspects of clinical informatics. IMIA Past-President Marion Ball and incoming IMIA President Reinhold Haux noted that electronic health records were increasingly being used around the world. The availability of more systems and more data produced a new breed of informaticians—those in charge of implementing, maintaining, and improving clinical health information systems. These informaticians had more applied research agendas, wanted to share lessons learned with their peers, and needed a recognized forum to exchange successes, failures, opinions, and thoughts. The number of people in this field continued to grow rapidly. In time, they would play an ever bigger and more important role at the interfaces between clinicians and their colleagues and patients. The meeting adjourned with the decision to write an editorial that articulated the need for a journal whose primary focus was applied clinical informatics.

### From Vision to Reality

The article summarizing the results of the meeting, entitled "Translational Research in Medical Informatics or from Theory to Practice," was published in 2008 and declared the need that IMIA perceived for a new applied journal.<sup>10</sup> The selection of a publisher was serendipitous. As then-IMIA President and as Editor-in-Chief of *Methods of Information in Medicine (MIM)*, Reinhold Haux had close connections with Schattauer Verlag owner Dieter Bergemann.<sup>11</sup> Schattauer Verlag also published IMIA's flagship publication the *Yearbook of Medical Informatics*. Prof. Haux arranged for a meeting with Schattauer's Dieter Bergemann, Dr. Andrea Schürig, Dr. Peter Henning, Jan Haaf, and Chris Lehmann. Although initially the idea of a new journal was met with skepticism, the final outcome of the meeting was an agreement—Schattauer would publish a new journal in clinical informatics.

Chris Lehmann was invited to serve as the Editor-in-Chief for the new journal. The first order of business was a name for the journal. The journal's title—*Applied Clinical Informatics (ACI)*—emphasized the focus on clinical systems and their

implementations. Manuscripts had to be informative but of significant applicable value to users of health IT. *ACI* emphasized the use of research methods to study the impact of health IT. The journal's goal was to serve as a manual, a guide, and a helpful reference that would make it easier to apply new skills, tools, and techniques to health information data and technology.

### Getting Off the Ground

*ACI*'s first editorial board was composed of leaders from the IMIA organization.<sup>12</sup> From the start, *ACI* aimed to establish a platform that allowed sharing of knowledge between clinical medicine, informaticians, and health IT specialists. *ACI* is known for bridging gaps between visionary design and successful and pragmatic deployment. One mission is to report on failures of implementation and systems to allow others to learn from and avoid the same mistakes.

### Review Process

From its inception, *ACI* used a double-blinded review process to reduce bias against authors from regions other than North America and Europe.<sup>13</sup> Authors do not know who the reviewers are, and reviewers do not know the authors and their institution. The latter requires the blinding of submissions to authors, their citations, and their institutions and countries. Over the years, several papers have slipped through the process with information remaining unblinded, and sometimes reviewers have been able to identify authors based on similar or related papers. However, the vast majority of papers have been reviewed in a blinded fashion. Because *ACI* has been an official journal of IMIA since its inception, one important goal for *ACI* was to become a journal that would publish manuscripts from low- and middle-income countries as well as developed countries.

### Early Years

Any new journal struggles with obtaining relevant, high-quality submissions, and initially this was the case for *ACI*. We used the connection to IMIA to advertise the new journal and started a relationship with the Association of Medical Directors of Information Systems (AMDIS) for 4 years to help promote the journal. A critical moment in the history of *ACI* came when the journal was listed in Medline. The hurdle to become indexed in Medline is high. A journal must "demonstrate quality of editorial work, including features that contribute to the objectivity, credibility, and quality of its content."<sup>14</sup> The journal has to be published for at least a year and must have published a minimum of 40 papers. *ACI* received its Medline indexing approval starting in 2012, which resulted in a significant increase in the number and quality of submissions.

### Clinical Informatics Subspecialty

*ACI* had been an official journal of IMIA since its start and became an official journal of the European Federation of Medical Informatics (EFMI) in 2021. Early on, the American

Medical Informatics Association (AMIA) Board of Directors declined *ACI's* request to be named an official AMIA journal. Subsequently, the American Board of Medical Specialties in the United States approved Clinical Informatics as a new subspecialty, creating with it the need for research and education in this new field.<sup>15–19</sup> Chris Lehmann became the first board-certified Clinical Informatician to chair the new sub-board at the American Board of Preventive Medicine and *ACI* was added to the official list of resources to study for the board examination. The new subspecialty and its need to provide a forum for research and education in the field resulted in the reversal of the AMIA's Board of Directors' position, and *ACI* became an official AMIA journal and provided free article access as a member benefit.<sup>20</sup> AMIA's endorsement was a major milestone in the history of *ACI* and significantly increased readers and manuscript submissions, which allowed *ACI* to improve its standards for manuscripts. By 2020, the manuscript rejection rate approached 70%.

Over the years, *ACI* has become a home for the new Clinical Informatics profession. It has provided a platform to discuss issues related to the new Clinical Informatics Fellowships such as Milestone Development,<sup>17</sup> Financing,<sup>21,22</sup> and Candidate Matching.<sup>23</sup> It also added to the discussion of the training and skill set for the new workforce in clinical informatics.<sup>24</sup> *ACI* also invited the best contributions at the AMIA Clinical Informatics Conference to be published in a special topic section in 2019 and 2021.<sup>25</sup> With the Clinical Informatics subspecialty, *ACI* introduced the Multiple Choice feature to manuscripts to aid applicants to study for the board examinations.

### Publisher Transition

In 2018, Dieter Bergemann sold Schattauer Verlag including the ownership of the journal *ACI* to Thieme Verlag—another German publisher. The transition saw many familiar friends and collaborators including Dr. Schürg and Mr. Jan Haaf leave the *ACI* orbit. Thieme Verlag was able to fill these vacancies with a new team that included Dr. Daniel Schiff, Graham Brumfield, and Dr. Elinor Switzer, who have worked diligently to further grow *ACI*. →Table 1 lists *ACI's* outstanding Managing Editors over the years.

### First Controversy—Impact Factor

Establishing a journal will create disagreements and issues. Since its inception, *ACI* has seen cases of plagiarism (usually self-plagiarism), authors' upset about rejections, and many attempts by predatory journals to acquire the journal. The

politics of academic publishing led to many disagreements and controversies. Perhaps the largest controversy arose in 2016, when Thompson-Reuters suppressed *ACI's* and *MIM's* impact factors. The journals were accused of stacking, a phenomenon in which an abnormally large number of citations from one journal appear in another journal. As the editors for both journals discussed, the issue arose from the publication of papers analyzing the interrelationship between the two journals. Each paper referenced a large number of papers from the other journal, which affected the Impact Factor calculation. As a result, both *MIM* and *ACI* were suspended for a year by Thompson-Reuters from the Impact Factor listing.<sup>26–28</sup> Editors still monitor the interrelationship between the journals without citing individual articles.

### Journal Measures

→Table 2 shows selected performance measures for *ACI* from recent years. In 2021, total submission included 316 papers. In 2021, the journal started to thank its reviewers publicly in an editorial.<sup>29</sup> We hope that this effort will translate into a future tradition.<sup>30</sup>

A recent article reviewing publications on “Electronic Health Record” found that *ACI* was the third most influential journal in this domain with 244 total publications on the topic, 244 total cited papers, and 2,178 total citations to these papers.<sup>31</sup>

### The Future

The ongoing worldwide adoption of electronic health record suggests that *ACI's* focus on applied issues of health IT will become even more influential and important. The growing importance of Clinical Informatics Board Certification<sup>20</sup> and future Advanced Health Informatics Certification<sup>32</sup> will require a more systematic approach toward examination preparation. *ACI* in 2016 required authors to add multiple-choice questions to their papers to help readers prepare for these exams.

### Conclusion

*ACI* started with a vision to highlight the application of clinical informatics to health care. It developed and blossomed because of serendipity, good timing, supportive organizations, an outstanding editorial board, and wonderful mentors. Ultimately, however, its authors and reviewers are the ones who have contributed most to its success.

**Table 1** *ACI's* managing editors since its inception

| Managing Editor       | Institution                | Period       |
|-----------------------|----------------------------|--------------|
| George R. Kim, MD     | Johns Hopkins University   | 2009–2010    |
| Jessica Holzner, PhD  | Johns Hopkins University   | 2010–2016    |
| Robert Cronin, MD, MS | Vanderbilt University      | 2016–2018    |
| Jenna S. Lehmann, MS  | Tennessee State University | 2018–present |

**Table 2** Journal measures for Applied Clinical Informatics 2019 to 2021

| Measurement description                  | 2021                                | 2020    | 2019   |
|--|-------------------------------------|---------|--------|
| Impact factor                            | IF 2021 to be released in June 2022 | 2.342   | 2.147  |
| Total citations                          | 511                                 | 415     | 338    |
| Total submissions                        | 316                                 | 278     | 252    |
| Days to first decision (all manuscripts) | 25.7                                | 21.2    | 23     |
| Days to final decision (average)         | 53.0                                | 41.0    | 55     |
| Total articles published                 | 126                                 | 89      | 104    |
| Acceptance rate                          | 39.9%                               | 32.0%   | 41.2%  |
| Full text downloads (HTML and PDF)       | 284,608                             | 200,350 | 65,056 |
| Mean Altmetric Attention score           | 5.7                                 | 6.43    | 4.8    |

## Multiple Choice Questions

- Since its inception, *Applied Clinical Informatics* journal has had TWO
  - Editors-in-Chief.
  - Publishers.
  - Major informatics organizations' endorsements.
  - Managing editors.

**Correct Answer:** The correct answer in option b. In 2018, Thieme purchased *Applied Clinical Informatics* from Schattauer. Christoph U. Lehmann, MD, has been the editor-in-chief since *ACI's* inception. The current Managing Editor Jenna Lehmann, MS, is the fourth in the line of Managing Editors. *ACI* had endorsement by multiple organizations including AMIA, IMIA, and EFMI.

- Applied Clinical Informatics* journal provides a home to which American Board of Medical Specialties' subspecialty?
  - Medical Genetics.
  - Bioinformatics.
  - Clinical Informatics.
  - Radiology Informatics.

**Correct Answer:** The correct answer in option c. *Applied Clinical Informatics'* Multiple Choice feature supports those studying for the clinical informatics exam.

### Conflict of Interest

None declared.

### Acknowledgments

The Editor-in-Chief appreciates the support from Schattauer and Thieme and wonderful professional organizations including IMIA, AMIA, and EFMI. The editor thanks his past and current editorial assistants and the editorial board. Moreover, of course, a heartfelt "thank you" to the readers, authors, and reviewers of *ACI*.

The authors thank Drs. Mark Frisse and Nancy Lorenzi for their critical review of this manuscript.

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