Educational Landscape of Biomedical Informatics in Croatia: Who Are the Teachers and What Are Their Attitudes

Kristina FIŠTER[a,1], Pero HRABAČ[a], Danko RELIĆ[a], Berislav IŠGUM[a] and Marijan ERCEG[b, c]

[a] *University of Zagreb School of Medicine, Andrija Štampar School of Public Health, Zagreb, Croatia*
[b] *Croatian Public Health Institute, Zagreb, Croatia*
[c] *University of Applied Health Sciences, Zagreb, Croatia*

Abstract. Lack of experts with complementary competences in the field of information technology as well as medicine and health care has been recognised as an important obstacle to successful computerisation of the health care system. Using a questionnaire survey, we aimed to describe the current educational landscape of biomedical informatics in Croatia, focussing on teachers' profiles and attitudes about existing educational opportunities in the field. Our findings show that Croatian institutions of higher education should better recognise the need for education in biomedical informatics. Dedicated programs need to be established and teacher force strengthened. Joint efforts of existing teachers—institutionalised through a working group focussing on education within the Croatian Society for Medical Informatics, for which strong support exists—might contribute to recognition of the field and improvement of educational opportunities.

Keywords. medical informatics, education, attitude

1. Introduction

Informatisation of health care is one of the priorities and strategic goals of the Republic of Croatia and the European Union, however lack of experts with complementary competences in the field of information technology as well as medicine and health care has been recognised as one of the obstacles to successful achievement of this goal [1].

Although courses in biomedical informatics (BMI) were introduced in Croatian higher education as early as 1967, at the University of Zagreb School of Medicine, and although global trends in BMI education were adhered to in the decades to follow, war events at the end of the 20th century have interrupted the existing postgraduate BMI studies as well as efforts aimed at starting BMI subspecialization programs for medical doctors of all specialties. Later, the initiatives for the renewal of these educational programs have been sporadic, coinciding with important global developments such as publication of educational recommendations by the International Society for Medical Informatics (IMIA) or initiation of subspecialisation programs in other countries [2, 3].

---

[1] Corresponding Author, Kristina Fišter, Rockefellerova 4, Zagreb, Croatia; E-mail: kfister@snz.hr.

Previous empirical research of BMI educational needs has provided guidelines for development of qualification standards and curricula in Croatia [1]. Our aim here is to describe the current educational landscape of BMI in Croatia, focussing on teachers' profiles as well as their attitudes about educational opportunities in BMI.

2. Method

2.1. Survey

We conducted an online questionnaire survey using a tool available to us freely through the Zagreb University Computer Centre [4]. The questionnaire comprised 24 items, spanning participants' demographic characteristics, educational and academic status, as well as experience in teaching BMI. Attitudes about BMI education in Croatia were assessed by 13 items with Likert scale answers (1=strongly disagree, 5=strongly agree).

In addition, participants were asked about BMI courses they teach (8 questions per course, including an upload of teaching plans, for a maximum of 15 courses) and were provided opportunity to express their opinions in free text about the need for and work opportunities for medical informaticians in the Croatian health care system. Responses to these items will be reported elsewhere.

2.2. Participants

We acquired the basic list of participants from the Croatian Society of Medical Informatics (CroSMI). This list was extended by online searches for higher education courses and programs in BMI in Croatia and affiliated teachers. The final sample consisted of 44 men and women who were invited to participate and received up to three reminders during the eight days while the survey was active in the spring of 2018.

2.3. Statistical Analysis

Normality of distribution for continuous variables was tested by Shapiro-Wilk test. Further analyses were performed using appropriate parametric or non-parametric tests. Alpha was set to 0.05. We used Statistica software package (v 13; Dell Inc, 2016).

3. Results

There were 22 respondents, for a response rate of 50%. Median age was 47.5 years (range 30-69), with equal numbers of men and women (Table 1). Median time spent in BMI education was 11 years (0-40), while the median length of overall working experience was 23.5 years (4-42). As could be expected, time spent working in education was associated with total working experience ($r=0,758$; $p<0,001$; Spearman correlation) as well as respondents' age ($r=0,679$; $p<0,001$). Women reported longer experience working in education than men (median 16 and 3 years, respectively; $P=0.012$; Mann-Whitney U) but there was no statistically significant difference in age or overall working experience between the sexes ($P=0.237$ and $P=0.131$, respectively).

Most respondents had graduated from a school of medicine, followed by faculty of electrical engineering and computing, and faculty of science. The category 'other' included two persons who had graduated from a faculty of pharmaceutical and biochemistry sciences, one each for faculties of teacher education, psychology, chemical engineering and technology as well as economics (same person), pedagogical polytechnic and faculty of mechanical engineering and naval architecture (same person), computer sciences, transport and traffic sciences, and medical laboratory diagnostics.

Table 1. Respondents' characteristics

Parameter	
Age (years - mean; range)	48.6; 30-69
Gender (female - N; %)	11; 50.0
Work experience (years - mean; range)	23.1; 4-42
Teaching experience (years - mean; range)	13.2; 0-40
Basic education (N; %)	
School of Medicine	5; 23.8
Faculty of Science	3; 14.3
Faculty of Electrical Engineering and Computing	4; 19.1
Faculty of Organisation and Informatics	1; 4.8
Other	8; 38.1
Scientific title (N; %)	
Research associate	6; 27.3
Senior scientific associate	2; 9.1
Scientific advisor	3; 13.6
Scientific advisor tenure	2; 9.1
No scientific position	9; 40.9
University scientific-teaching title (N; %)	
Assistant professor	3; 16.7
Associate professor	4; 22.2
Full professor	0; 0.0
Full professor tenure	2; 11.1
No scientific-teaching title	9; 50.0
Number of MI courses currently teaching (N; %)	
0	3; 13.6
1	12; 54.5
2-4	5; 22.7
5 and more	2; 9.09

Nineteen respondents reported current participation in teaching at least one BMI course at a higher education institution. Twelve respondents participated in a single course, one in two courses, one in three, three respondents reported participating in four courses, one in five and one respondent reported participation in nine courses. Most respondents did not have a university scientific-teaching title but were lecturers (N=7) or assistants (N=2). Similarly, most respondents did not have a scientific title.

Responses to the items exploring teachers' attitudes are shown in Table 2. Teachers strongly agreed that the institutions of higher education do not sufficiently recognise the need for education in BMI, and that dedicated university postgraduate professional studies in BMI should be established for all health professions. There was somewhat less but still support for establishment of postgraduate studies for non-medical graduates.

In addition, teachers strongly agreed that having IMIA compliant studies would be important for institutions of higher education, that compliance with IMIA educational recommendations could be achieved through the launch of a joint project of multiple

institutions, and that the establishment of an interdisciplinary field of biomedical statistics and BMI as a separate field in the domain of biomedicine and health care would help in positioning BMI as an independent discipline. Respondents also strongly supported establishment of a working group at CroSMI focussing on BMI education. In addition, most teachers strongly agreed there was a lack of staff available for teaching BMI courses, as well as about teaching plans being in need of updating.

The vast majority of respondents disagreed with the notion that students' previously acquired knowledge and skills in general informatics were sufficient. Also, despite most teachers being equivocal on this point, some teachers felt students generally did not show enough interest in BMI courses.

Answers were equivocal about sufficiency of the teaching hours available to BMI, as well as whether BMI should be taught in the final semesters of study, although most teachers strongly agreed with the latter.

Table 2. Responses to 13 items exploring teachers' attitudes about higher education in BMI in Croatia in the Spring of 2018. Numbers are N (%) if not indicated otherwise.

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Med	Mean
Teaching plans have enough hours at disposal	1 (5.9)	5 (29.4)	5 (29.4)	4 (23.5)	2 (11.8)	3	3.06
Teaching plans need updating	0 (0)	0 (0)	3 (17.6)	6 (35.3)	8 (47.1)	4	4.29
There are too few BMI teachers	0 (0)	0 (0)	4 (23.5)	5 (29.4)	8 (47.1)	4	4.24
Higher education institutions don't enough recognise the need for education in BMI	0 (0)	1 (5.9)	1 (5.9)	6 (35.3)	9 (52.9)	5	4.35
Students have sufficient previously acquired knowledge and skills in general informatics	0 (0)	13 (76.5)	3 (17.6)	1 (5.9)	0 (0)	2	2.29
Students do not show sufficient interest in BMI	0 (0)	1 (5.9)	8 (47.1)	6 (35.3)	2 (11.8)	3	3.35
BMI courses should be placed in the final semesters of study	2 (11.8)	2 (11.8)	5 (29.4)	0 (0)	8 (47.1)	3	3.59
University postgraduate BMI studies should be established for all health professions	0 (0)	0 (0)	2 (11.8)	6 (35.3)	9 (52.9)	5	4.41
-II- for non-medical professions	0 (0)	0 (0)	8 (47.1)	4 (23.5)	5 (29.4)	4	3.82
Having IMIA compliant studies would be significant for institutions of higher education	0 (0)	0 (0)	4 (25)	4 (25)	8 (50)	4.5	4.25
Compliance of BMI studies with IMIA recommendations can be achieved through a joint project of multiple institutions	0 (0)	0 (0)	3 (18.8)	7 (43.8)	6 (37.5)	4	4.19
Establishment of an interdisciplinary scientific field would help establish BMI as an independent discipline	0 (0)	0 (0)	3 (18.8)	5 (31.3)	8 (50)	4	4.19
I support establishment of the CroSMI edu working group	0 (0)	0 (0)	1 (5.9)	5 (29.4)	11 (64.7)	5	4.59

4. Discussion

BMI in Croatia is taught through courses which are integrated in curricula dedicated to various biomedical qualifications. Only one course we learned about was part of a curriculum educating future computer scientists. There are currently no postgraduate or other studies dedicated solely to BMI despite previous work on establishment of such programs.

There appears to be a lack of teachers of BMI in Croatia. Few respondents were of higher academic rank, including all types of professorships. Most participants did not have a university scientific-teaching title but were instead lecturers or assistants, which are entry level teaching positions with the latter having an obligation to acquire a PhD in order to advance towards a university scientific-teaching title. Similar was seen for scientific titles. Participants also strongly agreed there was a lack of teachers in the BMI field. Perhaps unsurprisingly given these circumstances, teachers' basic education varied widely, with some teachers coming from unexpected backgrounds such as economics, psychology, or traffic.

Much room seems to exist for the institutions of higher education in Croatia to recognise the need for education in BMI. Efforts of professionals in the field channelled through a working group at CroSMI as well as joint multi-institutional efforts to establish a designated study program that would be IMIA compliant were strongly supported by the respondents. There is hope that these and other activities, such as establishment of an interdisciplinary field of BMI as a separate scientific field in biomedicine and health care, perhaps together with biomedical statistics, would help in positioning BMI as a recognised and visible independent discipline.

Contrary to our experience of views often held by university teachers in fields other than BMI, teachers in this field strongly feel that students' previously acquired knowledge and skills in general informatics are insufficient. This may merit further study.

5. Conclusions

Croatian institutions of higher education should better recognise the need for education in BMI. Dedicated programs need to be developed and established, and teacher force strengthened. Joint efforts of existing teachers, institutionalised through a CroSMI education working group for which strong support exists, might contribute to recognition of the field and improvement of educational opportunities.

References

[1] D. Šimić, Editor, *Medical Informatics - Qualifications and Professions*, Zagreb University, Faculty of Organisation and Informatics, Varaždin, 2015.

[2] J. Mantas, E. Ammenwerth, G. Demiris, A. Hasman, R. Haux, W. Hersh, E. Hovenga, K.C. Lun, H. Marin, F. Martin-Sanchez, G. Wright (IMIA Recommendations on Education Task Force), Recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics. First Revision, *Methods Inf Med* **49** (2010), 105–120.

[3] D.E. Detmer, J.R. Lumpkin, J.J. Williamson, Defining the medical subspecialty of clinical informatics, *J Am Med Inform Assoc* **16** (2009), 167–8.

[4] *LimeSurvey [software]*. Available from *http://www.srce.unizg.hr/en/services/srce-apps/limesurvey*. Accessed 18th April 2018.