

Research work in general hospitals in Slovenia

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Abstract

Background: Research work is a fundamental element of medicine because it allows the transfer of scientific achievements into daily clinical practice. The purpose of the article is to present the organization of research work in Slovenian general hospitals. We were particularly interested whether the structure of employed doctors (the proportion of doctors with scientific and teaching titles) of general hospitals differ from the two university medical centers.

Methods: The data were obtained using the non-experimental quantitative method of data collection. The introductory part was designed on the basis of facts, and the research work was carried out using a structured questionnaire sent to ten general hospitals in the second half of September 2017.

Results: At the end of October 2017, Slovenian general hospitals employed 866 specialists and 568 other physicians; 8.6 % of physicians held a Doctor of Philosophy or a Master of Science degree; 1.1 % were university teachers. A comparison of the structure of employed physicians according to their professional, scientific and academic titles shows statistically significant differences between the two university hospitals on the one hand and the general hospitals on the other: $\chi^2 = 336.62$, $p < 0.0001$.

Conclusion: Most of the general hospitals have an organized research department in their structure. In comparison with the university hospitals, the share of physicians with scientific and academic titles in Slovenian general hospitals is significantly lower. With the development of information technology, better technical equipment of general hospitals and, in particular, the motivation of young doctors for research work, we can reasonably expect that the gap between general and university hospitals will gradually decrease.

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1 Introduction

High-quality health care services that we receive today are based on many years of research conducted by physicians, scientists and other health care professionals, who dedicated their entire life's work to improving the diagnosis and

treatment of various diseases. Thanks to their commitment several previously life-threatening conditions have been almost forgotten.

In general terms, research is defined as a close and planned observation, co-

llection of data and fact-based explanation of phenomena. Researchers in the field of medicine, like those in other branches of science, conduct research in order to improve our knowledge for the benefit of mankind.

Advances in medicine are gradually introduced in everyday clinical practice. New developments raise new questions, which can be answered only by carefully planned research. Thereby the circle between the clinical and the research work is closed.

Sometimes, it is assumed that it is enough to read scientific literature to stay abreast of the latest advancements in medicine. This a false line of reasoning. Even though scientific literature is widely available to health care professionals, their active participation in research is *a sine qua non* for high-quality clinical practice (4). Because of the systematic

approach to a particular problem (clinical issue), the use of pre-determined procedures, consistent adherence to the principles of good clinical practice, exact analysis and final data dissemination, research is viewed as having the same value as top-level clinical practice.

For understandable reasons, research was originally conducted in university hospitals. Clinical departments employed a relatively large number of physicians, the facilities were appropriately equipped and functioned as a teaching basis offering medical education to medical students.

Over the years, the number of doctors in general hospitals increased (9). The differences between general hospitals and university medical centres regarding the availability of medical equipment gradually decreased and with further development of information technology professional literature became more readily accessible. All these changes enhanced the development of research in general hospitals.

In the second half of October 2017, a scientific meeting on research in daily clinical practice was held during the annual conference of the Slovenian Medical Society. It addressed organisational forms of research at the primary, secondary and tertiary levels, in dentistry and in private healthcare settings.

The aim of this review paper was to present the organisation of research in Slovene general hospitals, with a special focus on possible differences between general hospitals and the two university medical centres as concerns their staff structure (i.e. proportion of scientific and teaching title holders).

Table 1: The questionnaire about the research in general hospitals in Slovenia.

Section 1. Hospital status	Yes	No
Has the hospital a teaching status?		
Has the hospital an organised research unit/service?		
Section 2. Researchers' Bibliographic units		
In the past five years, the employed doctors presented the following original research projects:		
• in scientific journals with impact factor		
• in other scientific journals		
• at international congresses/meetings		
• at national congresses/meetings		
Section 3. Demographic data	No.	
Specialists		
Other doctors		
Doctors holding a PhD degree		
Doctors holding a MSc degree		
Doctors holding a teaching title (Assistant Professor, Associate Professor, Professor)		

2 Methods

The data were gathered using a non-experimental quantitative data collection method. The introductory part was fact based, while research was conducted using a structured questionnaire sent to ten general hospitals in the second part of September 2017. The questionnaire comprised three sections of questions. The first section asked about the teaching status of the hospital, the second »Researcher bibliographic units« about the indicators of research performance, i.e. the number of research and professional publications, and the third section »Demographic data« included questions on professional scientific and academic university titles of the employed doctors. The questionnaire is presented in Table 1.

In addition to completing the questionnaire, some hospitals provided data

on the performance of research groups in compliance with the regulations outlined by the Slovenian Research Agency (ARRS) (1).

2.1 Statistical analysis

Descriptive statistical methods were used to present the values in individual tables. The χ^2 test was employed to determine the differences in staff structure between general hospitals and university medical centres, and the Cramer V was used to check the association strength between categorical variables. Percent deviation (PO) was calculated using the following formula:

$$PO = \frac{[(\text{calculated value} - \text{expected value}) / \text{expected value}] * 100}{(1)}$$

Table 2: Bibliographic performance indicators for research groups in Slovenian general hospitals.

General hospital	Score	A ² Exceptional achievements	A ¹ High-quality achievements	A1/2 Important achievements	C110 No. of pure citations of scientific papers (2008–2017)	C1max The most notable publication (2008–2017)	h-Index (2008–2017)	A1	A3
Celje	1,108.64	59.38	289.46	385.06	2,703	530	20	3.44	0
Ptuj	40.73	1.08	1.08	9.62	67	17	5	0.12	0
Jesenice	613.89	3.67	12.65	29.37	1,618	1,186	13	1.65	0
Murska Sobota	3,194.84	430.37	1,455.65	1,748.01	5,021	1,218	30	8.97	0.79
Novo mesto	114.51	0	0	0	5	5	1	0.31	0
Slovenj Gradec	780.43	4.97	22.58	188.66	454	117	11	2.21	0

Data for the past five years (citations for the past ten years) on 30 July 2018; A3 for the period 2012–2016.

[Source COBISS.SI/COBIB database; 30 July 2018]

Statistical computation was performed using the VassarStats (Vassar College Poughkeepsie, NY, USA).

3 Results

All general hospitals in Slovenia are registered as teaching hospitals. Most of them have research departments, which are as a rule independent units separated from other clinical departments and services (e.g. general hospitals in Nova Gorica, Celje, Jesenice, Murska Sobota and others).

Through these research departments doctors were included in several research projects funded by the ARRS, either as principal investigators (e.g. Murska Sobota General Hospital: »Epidemiology of heart failure in Slovenia: prevalence, hospitalisation and death rates« – J3-7405) or partners (e.g. Celje General Hospital: »Identification of new RANKL expression regulators, a key molecule not only in bone remodelling«, J3-7425). Research groups collaborated with university medical centres, research institutes and other university departments (2), and participated in some

EU-funded international projects (e.g. international project United4health – Slovenj Gradec General Hospital (8) and Trans2care – Nova Gorica General Hospital (3)).

In addition to completing the questionnaire, some hospitals provided data on their research groups performance, measured in compliance with the ARRS regulations. Table 2 shows bibliographic indicators of researchers' performance retrieved from SICRIS – the Slovenian Current Research Information System (<http://www.sicris.si>).

Data on scientific and professional publications of research organisations registered with ARRS were retrieved from SICRIS database.

Six hospitals registered in compliance with the ARRS requirements had the assigned researcher's codes. Their bibliographic potential is indicated by the number of pure and total citations for papers linked with the records in WoS and Scopus citation bases. The highest number of total and pure citations was recorded for the Murska Sobota General Hospital, followed by the Celje and Jesenice General Hospitals (Table 3).

Table 3: Citation rate of bibliographic records in COBIB.SI linked to records in citation databases (2008–2018)

General hospital	Citations		Pure citations		Average number of pure citations	
	WoS	Scopus	WoS	Scopus	WoS	Scopus
Celje	2437	3086	2336	2971	14,69	21,69
Ptuj	77	98	70	90	4,67	6
Jesenice	1380	1696	1354	1665	33,02	37
Murska Sobota	5184	6127	4715	5670	18,13	23,92
Novo mesto	21	33	21	33	2,1	6,6
Slovenj Gradec	460	560	415	512	4,91	7,31

Source: COBISS.SI/ COBIB.SI database; 1 August 2018; WoS, Scopus..citation databases.

The »Demographic data« section provides information on the number of employed specialists, other doctors and holders of doctoral and master's degrees and academic teaching titles. At the beginning of October 2017, general hospitals in Slovenia employed 876 specialists, 568 other doctors, of whom 59 holding a M.Sc. degree and 66 a Ph.D. degree, and 16 faculty members. Table 4 shows hospital medical staff structure by degrees and academic ranks.

8.6 % of all doctors employed in general hospitals were master's or doctoral degree holders. There were 16 (1.1 %) faculty members with academic titles.

Statistically significant differences were found between both university medical centres and general hospitals in terms of professional, scientific and university teaching titles held by the doctor staff ($\chi^2 = 336.62$, $p < 0.0001$, Cramer $V = 0.198$). In the University Medical Centre Ljubljana 35.6 % of do-

ctors hold a master's or a doctoral degree as compared to 29.2 % of M.Sc. and Ph.D holders in the University Medical Centre Maribor. 15.5 % of doctors in the University Medical Centre Ljubljana vs. 11.8 % in the University Medical Centre Maribor are faculty members with academic titles (5).

4 Discussion

Our survey of the organisation of research in Slovene general hospitals showed that most of these hospitals have research departments, which form a network of all research-related activities. This structure provides an overview of research activities conducted in individual hospitals, thereby enhancing participation of researchers in national and international research projects. Also, administrative support is given to investigators in their creation of bibliography and pursuit of funding for active

Table 4: Hospital medical staff structure by professional and scientific degree and teaching title

Hospital	Specialists	Other doctor staff	Holders of PhD degree	Holders of MSc degree	Holders of teaching ranks*
Murska Sobota	89	66	8	13	4
Ptuj	38	30	2	4	1
Slovenj Gradec	91	65	8	9	1
Novo mesto	122	75	7	7	0
Brežice	37	33	2	2	1
Celje	200	114	17	19	4
Trbovlje	25	13	1	0	0
Jesenice	76	54	1	4	0
Izola	93	62	6	7	3
Nova Gorica	105	56	7	1	2
Total	876	568	59	66	16

*Academic ranks: Assistant Professor, Associate Professor, Professor.

participation at scientific meetings (5). It is delightful to note that the results of their research projects have been published in a number of scientific journals with impact factors, which is an indirect indicator of their quality. Bibliographic indicators of research performance allow for a comparison between research groups, and increase their motivation for further work. In addition, bibliographic indicators are used for the rating of research projects required for the funding/co-funding of research by ARRS.

As expected, the proportion of doctors holding scientific degrees is lower in general hospitals than in the two university medical centres: 35.6 % in UMC Ljubljana, 29.2 % in UMC Maribor and 8.6 % in general hospitals. The same applies for the percentage of faculty members, the difference between the institutions being significantly higher: 15.5 % for UMC Ljubljana, 11.8 % for UMC Maribor and 1.1 % for general hospitals. These figures clearly indicate that for doctors working in general hospital the path from a doctorate degree to an academic position at the university is a difficult one. A partial explanation for that is provided in the document »Criteria for election to titles of higher-education teachers« (6). Best-rated research papers

are published papers, which are always the result of well-organised research endeavours. Earning credit points from the publishing of teaching materials and mentorships is quite a challenge for holders of academic titles in general hospitals. This is best illustrated by the invitation of nominations for the Prešeren award for students of the Faculty of Medicine, University of Ljubljana for the 2017 school term which showed that only three (2.1 %) of the 140 mentors and co-mentors were doctors employed in general hospitals, the rest of them came from UMC Ljubljana (105) and Faculty of Medicine (32) (10).

This situation is largely due to doctor shortage in general hospitals: because of a relatively small number of doctors employed in general hospitals (876 specialists in general hospitals vs. 1,228 specialists in university medical centres) (Table 4 and Table 5) considerably less time is available for research. Moreover, doctors in general hospitals cannot rely on medical students, residents and junior researchers for help to the same extent as their colleagues in university medical centres. Medical staff in general hospitals is overburdened with routine work in a broad area of individual specialties

Table 5: Medical staff structure in both university medical centres and general hospitals.

Institution	Specialists	Other doctors	Holders of M.Sc and Ph.D degrees	Faculty members
UMC Ljubljana	856 (-9.8 %)	438 (-19.1 %)	461 (+36.4 %)	201 (+57.6 %)
UMC Maribor	352 (-3.7 %)	182 (-12.6 %)	156 (+19.9 %)	63 (+28.3 %)
General hospitals	876 (+13.9 %)	568 (+29.5 %)	125 (-54.4 %)	16 (-84.5 %)

Legend: no. of doctors (percentage of deviation).

and their choice of research topics is therefore limited

And last but not least, it is important to stress the impact of doctors' motivation for research. Unlike in university medical centres, in general hospitals promotion does not depend on research activities. In addition, an important role is played by the environment, i.e. a researcher's co-workers and hospital leaders. Doctors who are not engaged in research activities regard an investigator as a »disturbing factor«; the main goal pursued by hospital leaders is to implement the agreed-upon programme. Research is not a priority for the hospital management and they do not promote it (according to the author's long experience).

Because of advances in information technology, developments in hospital technical equipment and, above all, thanks to increased motivation of junior doctor staff for research, we have every reason to believe that the number of research projects and consequently the

rate of doctors holding scientific degrees and teaching ranks will increase in the future.

5 Limitations of the study

Data presented in the study were collected using a questionnaire and were retrieved from the SICRIS database (<http://www.sicris.si/public/>). Since only six of the ten hospitals enrolled in the study have research groups registered under ARRS, inter-hospital comparison of research performance was not possible.

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