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**Attitudes Towards the Importance of
Specialist Training in Nursing**

Health Literacy in Chronic Patients with Epilepsy

Specificities of Nursing Care of Conjoined Twins

Abbreviation Use Habits in Nurses' Work

Nursing Care in Hip and Knee Arthroplasty in Day Surgery

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A Review Paper**

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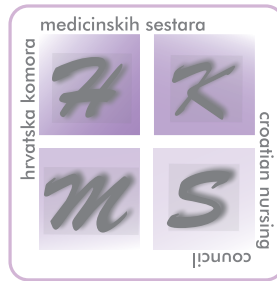
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Attitudes Towards the Importance of Specialist Training in Nursing

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Abstract

Introduction. For a considerable period, nursing was regarded as a female-dominated profession that operated under the supervision of physicians and lacked its own distinct domain of practice. Nursing is a profession that was for a long time seen as a female profession, under the direction of doctors and without its own field of activity. Today's complexity of treatment and health care requires specialized and experienced nurses to ensure quality outcomes for patients. Modern nursing faces many challenges, especially pandemics, inflexible working hours and lack of independence at work. The question is whether, by transforming the healthcare system, the role of nurses will also be reconsidered.

Aim. To present the views of the nurses of the General Hospital of Šibenik-Knin County on the need for specialist training in nursing.

Methods. The research was conducted in form of a survey questionnaire which was administered to a group of 146 nurses who were employed at the General Hospital of Šibenik-Knin County. It consisted of data on specialist education in nursing (the attitude of nurses on the need for specialization, their awareness of it). The analysis was performed in the statistical software SPSS 25.

Results. Nurses with secondary vocational education predominate in the conducted research. They are mostly employed in the hospital department. They state a higher level of knowledge in a narrowly

specialized field as the main motive for specialization. A statistically significantly higher number of participants expressed their intention to continue their education in the future and progress professionally. The limitation in this intention stems from the fact that the majority of participants are not familiar with the specialization program, even though their attitudes support specialization.

Conclusion. On the basis of the conducted research, the results are reached which show that the nurses of the General Hospital of Šibenik-Knin County encourage specialist education within the profession. The largest number of respondents believe that specialization in the nursing profession can lead to an increase in the quality of service, and the main reason for specialization is a higher level of knowledge in a narrowly specialized field of work. Also, the largest number of participants intend to continue their education, but most of them are not familiar with the possibilities of specialization within the profession. Hypotheses that tested whether nurses' attitudes towards specialist education differ based on length of service, level of education and workplace were rejected.

Introduction

Chronic non-communicable diseases are increasing all over the world. In Europe, according to data from the World Health Organization, 86% of mortality and 77% of disease burden are caused by chronic non-communicable diseases.

The population of our country is counted among the "old population" with a high proportion of people over 65 years of age. The total average of life expectancy increased from 71 years to 77 years. According to indicators of mortality and morbidity, non-chronic infectious diseases prevailed in Croatia before the pandemic, which was the cause of mortality in 93% of cases. For example, cardiovascular heart disease, as a leading chronic non-communicable disease, although on the rise, has seen a decrease in mortality, thanks to advancement in treatment and health care, as well as primary, secondary and tertiary prevention (1). Nursing means providing health care inde-

pendently or in a team to all age groups, individuals, families and communities, sick or healthy in all circumstances (2).

Thirty thousand employed nurses make up more than 40% of all employed health workers. However, the continuous shortage of nurses in Croatia is manifested by a ratio of only 6.3 nurses per 1,000 inhabitants, which is below the European average of 8.4 nurses (3). The number of nurses per capita is the highest in Denmark, Finland, Switzerland and Iceland, but it should be noted that one-third of that number are health assistants to nurses (4). The shortage of nurses in Europe has consequences on the quality and continuity of care for patients, and puts the nurses themselves at serious risk due to work overload. Studies conducted in 300 hospitals in nine European countries show that heavy nursing workload is associated with a 7% increase in the rate of death of patients after surgery within 30 days, and a 10% increase in bachelor's degrees in nursing reduces mortality by 7%. These connections imply the importance of bachelor's degree education for nurses, and clearly show that the number of bachelor's degree nurses in the ward means high patient safety and satisfaction (5).

In Croatia, the basic education of nurses consists of a five-year high school education, and a higher level of education is obtained by completing an undergraduate professional or university nursing programme, and/or a graduate university nursing program. In the Nursing Act of the Republic of Croatia, additional training of nurses is carried out in cases where the scope and complexity of work and expected results require additional education, or specialization in a certain area of health care. Duties and competencies of a nurse depend on the level of training. Competences of nurses with completed specialist training and post-graduate university programs are determined by the list of output competencies/learning outcomes in accordance with the regulations on specialist training of nurses (6). The joint mandatory part of the undergraduate university and professional nursing study program is aligned with the provisions of Directive 2005/36/EC of the European Parliament and the Council on the recognition of professional qualifications (7).

The Ministry of Health adopted the Rulebook on the specialist training of nursing bachelors in the field of emergency medicine, as the first specialization in nursing. The intern is considered to be a nurse with

at least a bachelor's degree in nursing, who is employed for an indefinite period of time in a health institution. The annual need for specializations of healthcare workers is determined by a decision of the minister. The specialization will last one year, the theoretical part of the specialization will be carried out at universities, and the clinical part in authorized health institutions. After passing the specialist exam, the title "specialist in emergency medicine" is obtained (8).

The complexity of treatment in the acute and chronic phase of the disease requires specialized healthcare in order to ensure quality outcomes for the patient.

Specialist nurses are not a novelty in the world. In Great Britain, there are various specializations in nursing, which are divided into two groups: Specialist Community Public Health Nurses SCPHN and Nurse Practitioner. The requirement for specialization is a bachelor's degree. The education lasts 1 year full-time, which includes 50% theoretical and 50% practical part, and is focused on clinical health care, leading and managing health care in the clinic. In addition to specialist areas such as hematology, oncology, surgery, etc., there are also narrow specializations such as specialist nurse for patients with Multiple Sclerosis, etc. (4).

Aim

The aim of the research is to show the views of nurses of the General Hospital of Šibenik-Knin County regarding the need for additional education in nursing, the perception of the importance of specialist education, motives and intentions for specialization. The level of information of nurses about specialist education in nursing is shown.

The aim is also to determine whether there are differences in the attitudes of nurses with regard to the level of education, the length of service in the nursing profession and the position they hold. In the paper, we stated two hypotheses about the attitudes of nurses in the General Hospital of Šibenik-Knin County:

Hypothesis 1: The attitude of nurses towards specialization differs according to the level of education.

Hypothesis 2: The attitude of nurses towards specialization is statistically significantly related to the workplace of the participants.

Methods

Design

The research was conducted by means of a structured survey questionnaire with closed-ended questions. The questionnaire used in this research was compiled using the questionnaire from the article "A new system for nursing specialization", the use of which was approved by the original authors. It is entitled "Opinions of nurses on the importance of specialist training". The research was conducted anonymously through an online service available through the Google platform, and anonymity was ensured in such a way that the contact information of the participants (e-mail addresses) could not be linked to the answers of individual participants. The target population for the research was nurses, and the research was conducted on a sample of N=146 nurses from the General Hospital of Šibenik-Knin County. Data were collected individually and online. The conduct of the research was approved by the Ethics Committee of the General Hospital of Šibenik-Knin County on October 3, 2022. The research was conducted in the period from October to November 2022.

Statistics

Numerical values are presented using methods of descriptive statistics, where the arithmetic mean is used as the mean value, while in case of deviation of numerical values from the normal distribution, the median is used.

The existence of a connection between certain variables is determined by the correlation coefficient and the existence of a statistically significant difference by the Chi-square test as method of inferential statistics. Due to failure to meet the conditions for the ANOVA test, the Kruskal-Wallis test was used.

The analysis was done in the statistical software SPSS 25.

Results

Most of the participants were female N=142, while N=4 participants were male.

According to age, it can be determined that 1 respondent is under the age of 20, while the largest number of participants is between 21 and 30 years old (n=39) and between 31 and 40 years old (n=39).

The most common level of education of nurses is a completed secondary vocational education (n=82). A proportion of n=48 nurses have a bachelor's degree in nursing, while a total of n=16 nurses with a master's degree took part in the research.

The data in chart 1 show that the largest number of participants have a working experience of more than

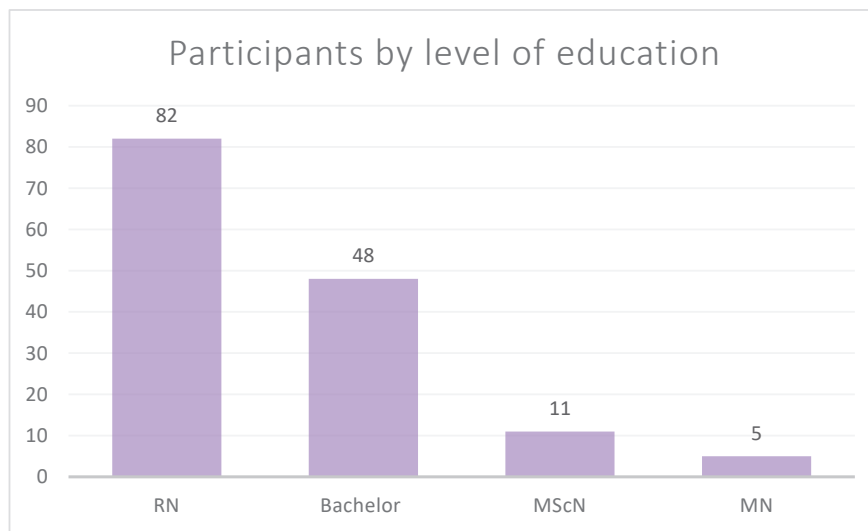


Chart 1. Participants by level of education

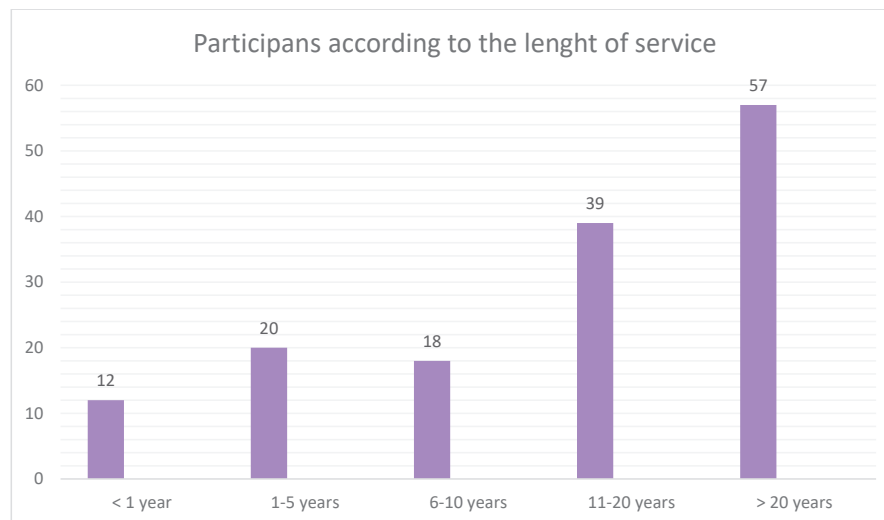


Chart 2. Participants according to length of service

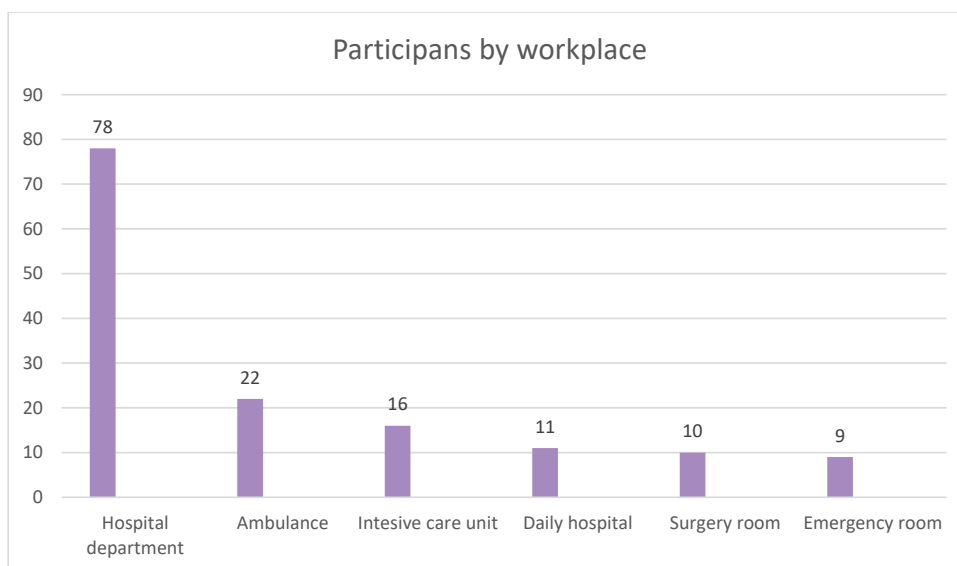


Chart 3. Participants by workplace

Table 1. Participants' attitude towards additional education		
Claim	AS	SD
Further education and training of nurses affects the well-being of patients and the improvement of health care	4.34	1.00
Nurses have a rightful place according to the level of education in the business hierarchy	2.60	1.23
By specializing in a certain area, a nurse would be much more successful in providing services within the scope of specialization	4.49	0.84
Any additional education of a nurse should be monetarily valued according to the law	4.84	0.57
I value a more experienced nurse with less education more than a more educated nurse with less work experience	3.70	1.22
The process of training nurses is easy and simple	2.06	1.13
Already in high school, it should be possible to become a specialist in a specific area of work for a nurse	3.06	1.46
I believe that working in the anesthesiology department requires additional specialization of nurses as in highly developed countries	4.61	0.73

*AS=arithmetic mean; SD= standard deviation

20 years (n=57), while only one respondent has a working experience of up to one year.

The largest number of participants are employed in the hospital department (n=78), while only 9 participants are in the emergency clinic (n=9).

Participants expressed their attitude towards additional education by expressing their agreement with certain statements about specialist education using a Likert scale from 1 to 5, where 1 means 'do not agree at all', 2 'do not agree', 3 'neither agree nor disagree', 4 'I agree' and 5 'I completely agree'.

Participants expressed the highest level of agreement with the statement "Any additional education of a nurse should be monetary valued according to the law", where a high level of agreement with the statement was determined at 4.84 (SD=0.57), while the statement with which the participants least agreed was "The process of training nurses is easy and simple" with a low average score of agreement with the statement of 2.06 (SD=1.13), which corresponds to the qualitative statement "disagree" on the Likert scale.

The way in which participants perceive the contribution of specialization to the nursing profession was

examined through a closed question, and participants could choose between one or more pre-determined answers (chart 4).

The largest number of participants (n=50) believe that specialization contributes to the nursing profession in a way that increases the quality of service in the healthcare system. Participants (n=48) recognized the reduction of the possibility of error as an important contribution of specialization in nursing, and n=33 of them believe that specialization leads to greater loyalty to work and a higher level of employee satisfaction. The number of participants who recognized the growth of self-confidence due to training as an important contribution of specialization is n=13. To summarize, a total of n=98 participants consider the improvement of the quality of services and the reduction of errors to be important contributions of specialization and understand the contributions from the patient's point of view, while n=46 participants recognized the contributions that specialization brings to themselves.

Following the perception of the contribution of specialization for the participants, chart 5 highlights the basic motives when making a decision on specialization. Participants could choose one or more of the

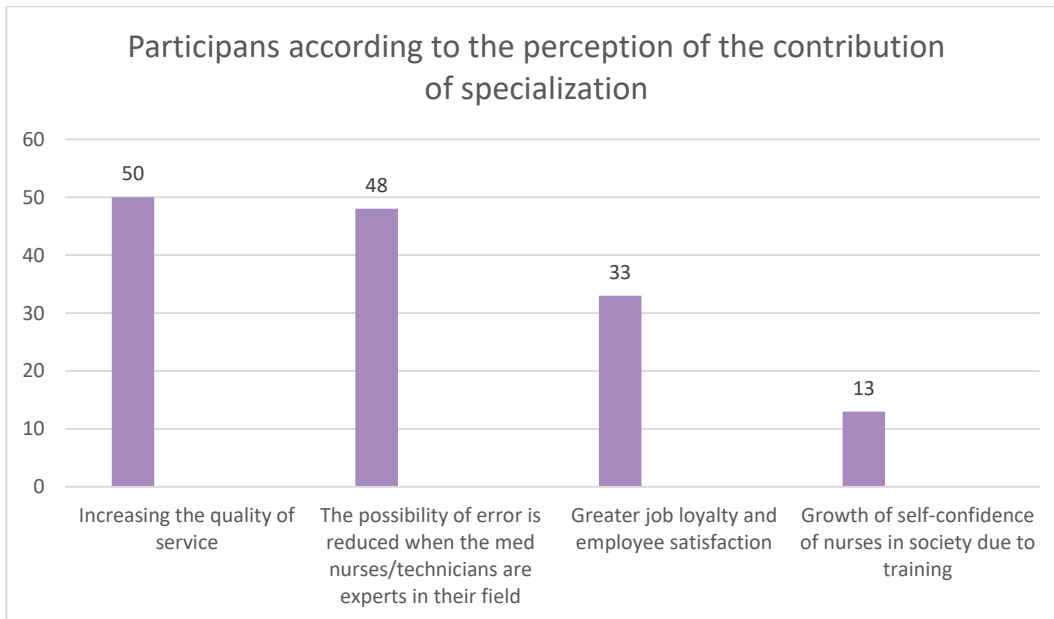


Chart 4. **Participants according to their perception of the contribution of specialization to the nursing profession**

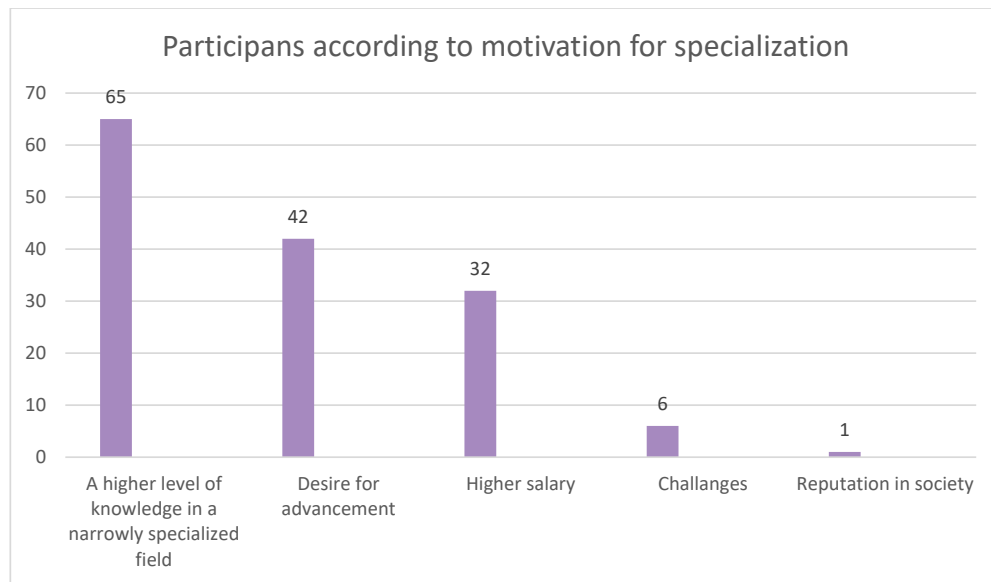


Chart 5. **Participants according to motivation for specialization**

pre-determined answers (higher level of knowledge, desire for advancement, higher salary, challenges and social reputation).

The data in Chart 5 shows that a total of n=65 participants are motivated by the desire for a higher level of knowledge in a narrowly specialized field, and as many as n=42 participants are motivated by the desire for advancement and a higher salary (n=32). Challenges and reputation in society are less preva-

lent motives for specialization in nursing. Challenges are motivation for n=6 participants, and reputation in society for n=1 participant.

Chart 6. shows the intention to continue education in the future

According to the intention of continuing education in the future, it can be determined that the larg-

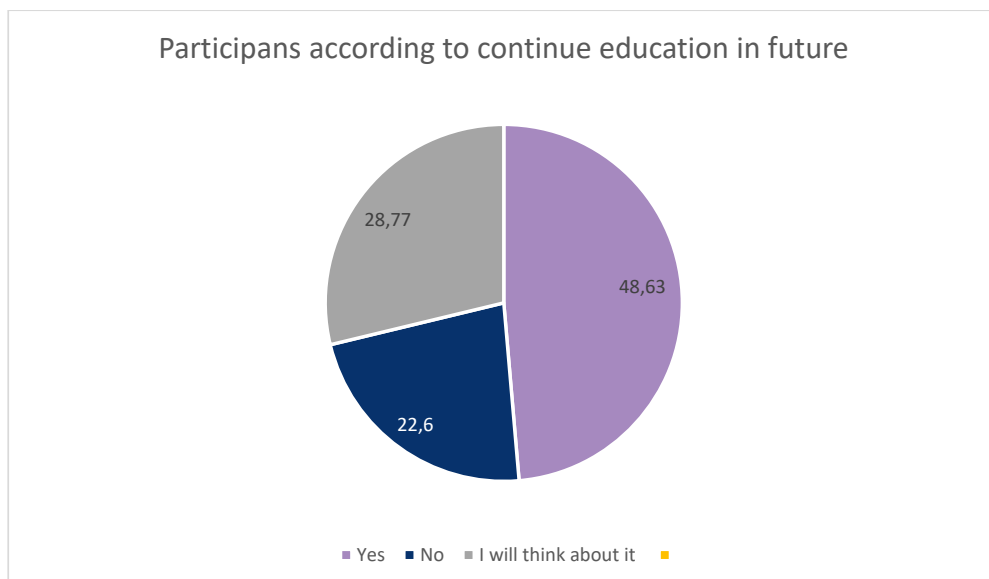


Chart 6. **Participants according to their intention to continue their education**

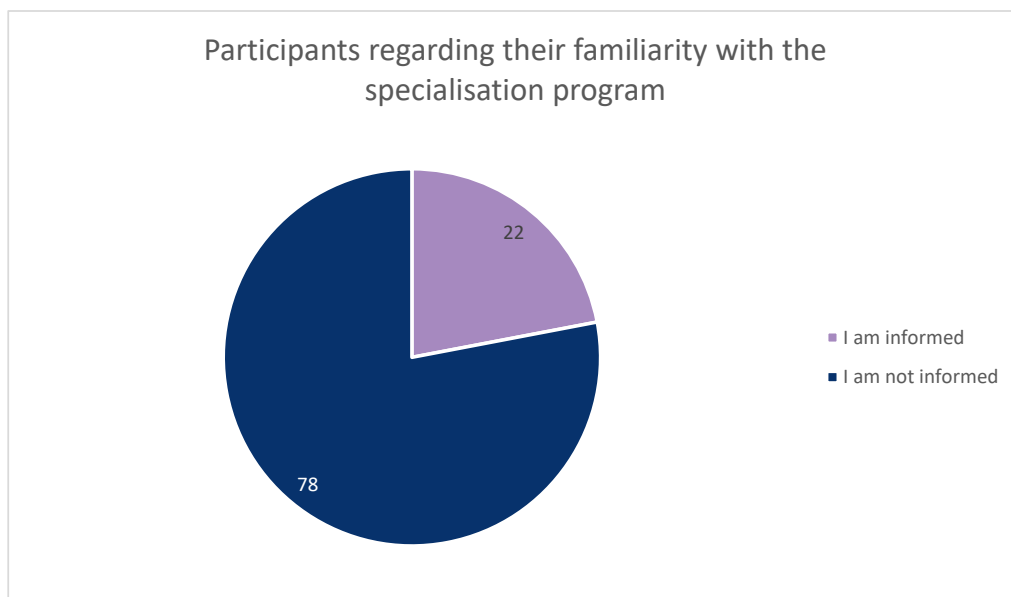


Chart 7. **Participants regarding their familiarity with the specialization program**

est number of participants have this intention (71; 48.63%), while 33 participants (22.6%) do not have this intention. The need for further reflection on the decision to specialize in nursing was expressed by 42 participants or 28.77%.

Chart 7 shows the extent to which participants are familiar with (informed of) the nursing specialization

program. Participants could choose one of the two answers; I am informed and I am not informed.

The data in chart 7 shows that the number of participants who are informed of specialization programs is lower compared to participants who do not have available information about specialization programs. Thus, the number of informed participants is $n=32$ or 22%, and the number of those who do not have infor-

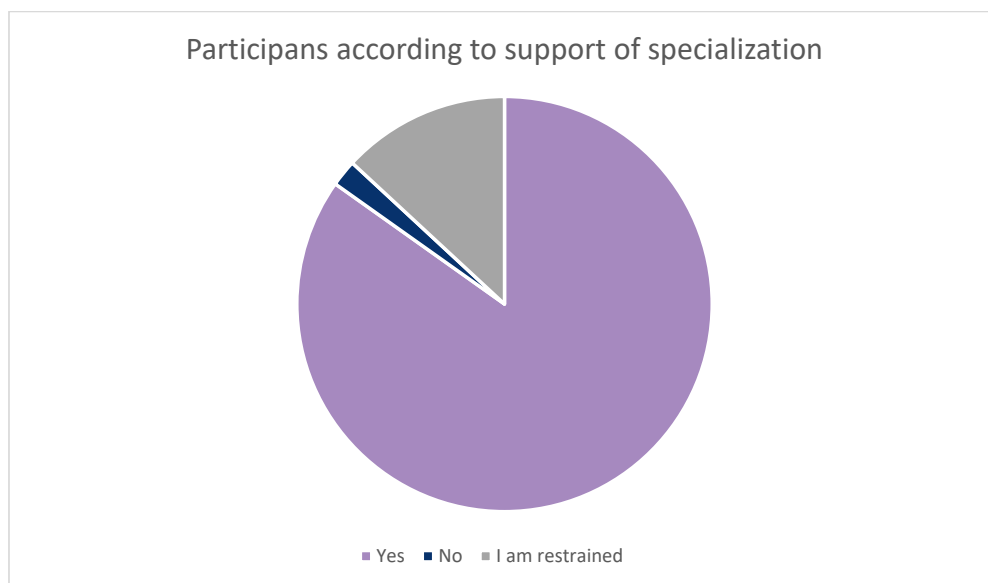


Chart 8. **Participants according to support of specialization**

mation about specialization options is even $n=144$ or 78%.

Chart 8 shows the results on the level to which participants support the specializations of nurses.

The largest number of participants support the specializations of nurses ($n=123$; 84.83%). A share of 13.1% of participants expressed restraint, and only $n=3$ or 2.07% of participants do not support the specialization of nurses.

Chart 9 shows the views of participants on the potential problems of implementation of specialization within the profession. These potential problems can be divided into three key categories, which are problems related to the organizational structure or organization of the department. Such problems include the reduction of the possibility of employee migration between different departments and the limited authority and responsibility of nurses. The second category of problems actually represents motives for non-specialization (the impossibility of practicing education in a working environment and the unavailability of certain specializations). The third category of problems can include the potential negative per-

ception by the professional team about nurses who refused specialization.

The most significant organizational problem arising from the implementation of specialization is the reduced possibility of migration within the department, according to the view of $n=37$ participants, and $n=31$ participants recognize limited powers and responsibilities as a problem in the implementation of specialization. When considering the motives "against" specialization, it should be noted that $n=42$ participants believe that they will not be able to apply the acquired skills in a working environment, while $n=27$ participants are of the opinion that the unavailability of certain specializations is a problem when implementing specialist programs. Only $n=9$ participants consider the negative and unfavourable position of nurses who refused to specialize to be a problem.

Hypothesis testing

H1: The attitude of nurses towards specialization differs according to the level of education

The presence of a statistically significant difference was not established, so hypothesis H1, which as-

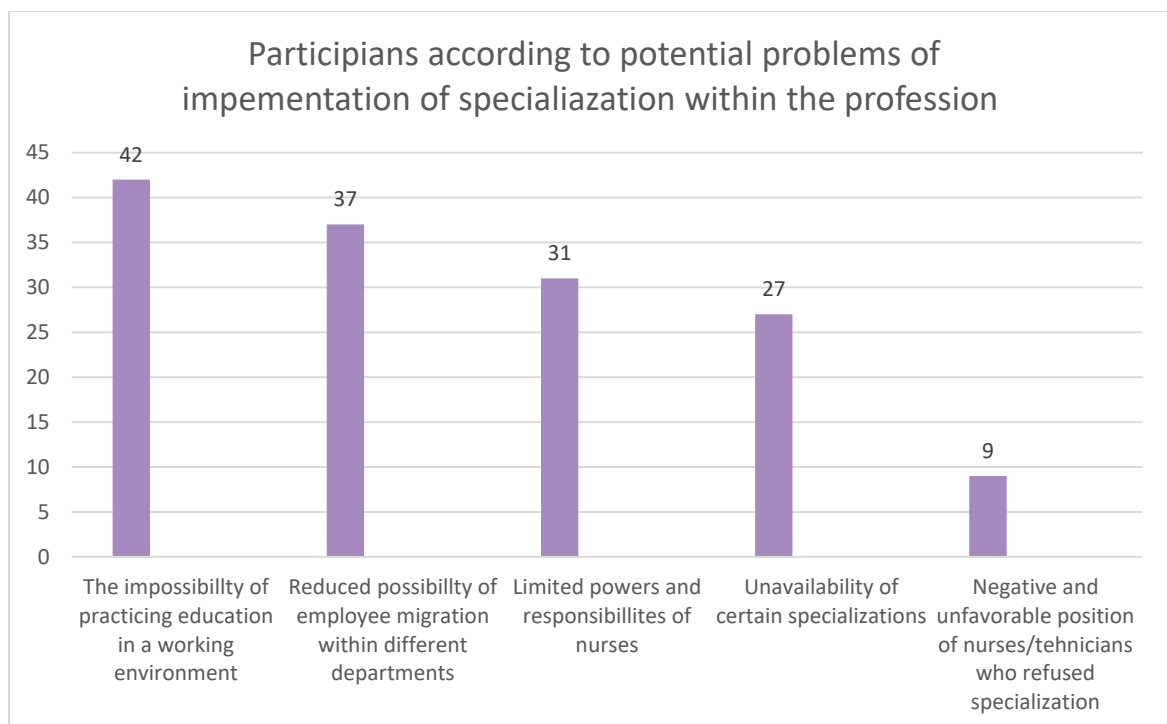


Chart 9. **Participants according to potential problems of implementation of specialization within the profession**

Table 2. Correlation coefficient: connection between nurses' attitude towards specialization and length of service

	Length of service	Attitude towards improvement
Length of service	1	
Attitude towards improvement	-0.2376	1

p value=0.075

sumes that the attitude of nurses towards specialization differs according to education, is rejected.

Based on the data in Table 2, it can be concluded that there is a negative correlation or an inversely proportional relationship between the length of service and the attitude of nurses towards training. When evaluating the strength of the relationship between the variables, a result of 0-0.25 is considered a weak correlation, and the obtained result of -0.23 points to a correlation of a negative direction and a weak correlation between the length of service and the attitude towards improvement, in such a way that a longer length of service is associated with a lower level of positive attitude towards improvement. The empirical p -value of 0.075 is higher than the threshold p -value of $p=0.05$, and the hypothesis of a statistically significant relationship between the attitude towards specialization and length of service is rejected.

H2: The attitude of nurses towards specialization is statistically significantly related to the respondent's workplace

Hypothesis 3 was tested by calculating the correlation coefficient in order to determine the connection between the attitude of nurses towards specialization and the workplace where the respondent is employed (outpatient clinic, emergency clinic, hospital ward, day hospital, intensive care unit and operating room) (Table 3).

Based on the data in Table 3, it can be concluded that there is a negative correlation or an inversely proportional relationship between the workplace and the attitude of nurses towards training. When evaluating the strength of the relationship between the variables, a result of 0.25-0.60 is considered a moderate correlation, and the obtained result of -0.30 points to a correlation of a negative direction and a moderate strength between the workplace and the attitude towards improvement, in such a way that the attitude towards improvement is more present in subjects employed in day hospitals, in hospital wards, intensive care units and in the operating room compared to subjects employed in outpatient clinics and emergency clinics. Since the obtained p value is 0.55 higher than the threshold p value of $p=0.05$, H3 is rejected.

Discussion

In terms of the structure of the participants, most participants were females, with mostly secondary education, younger (21-30) and middle (31-40) age groups, the largest number of whom have 20 years of experience. The largest number of participants were employed in hospital wards, and among the participants there was a smaller number of emergency room staff.

Specialist programs in nursing have an important role in raising the overall quality of medical care, because through nursing care and the educational and advi-

Table 3. Correlation coefficient: connection between nurses' attitude towards specialization and workplace

	Employees by individual workplaces	Attitude towards improvement
Employees by individual workplaces	1	
Attitude towards improvement	-0.304131124	1

p value=0.55

sory role in certain branches of medicine in which they specialize, they can significantly and positively influence the results of health care (9). The above statements are in accordance with the results of the conducted research, considering that the largest number of participants perceive that the improvement of the quality of service and the reduction of the possibility of error are the most significant benefits that can be obtained by the implementation of specialist programs in nursing. The motives of the majority of the participants are consistent with the view that specialization contributes to the increase in the quality of services, and the majority of participants emphasize the desire for narrowly specialized knowledge as the basic motive for specialization.

The need for specialization in nursing is recognized at the international level, but also in Croatia. Regarding the participants' knowledge of the specialization program, we note a negative trend in which a large percentage of the participants are not familiar with the possibilities of specialization. The specialization program itself in the Republic of Croatia was introduced in 2009, which provides that nurses with a completed undergraduate level of education can enrol in the specialization. The stated claims can be supported by the results of the conducted research. Namely, a large proportion of participants expressed a firm intention to continue their education, and the proportion of participants who are thinking about the option of further education is not negligible either, but the level of information about specialist programs they have is very low, as the results show. The observed disparity between the intention for further education and the level of information about the possibilities of further education in nursing is crucial to bridge through the organization of educational and promotional activities among the target population of nurses.

The majority of participants supported the statement "By specializing in a certain area, a nurse would be much more successful in providing services within the scope of specialization", as well as agreed that specialist education within the profession is necessary. As the health sector systematically develops and evolves, so does the constant need for highly qualified nurses. The outstanding results of the research confirm that specialist programs for the education of nurses are also a reflection of the growing need for very specific knowledge and competencies of nurses (10).

Bagat (according to Ivanov) conducted research in which he examined the motivation of healthcare workers in Croatia, which included six factors of motivation. A very small percentage of participants believed that the institution where they are employed implements employee motivation, and the awards that would be used to evaluate motivation were in terms of further training and education. In the research carried out in this work, the main motive for specialization is a higher level of knowledge in a very specific field. Therefore, it is justified to conclude that healthcare institutions should focus more on encouraging motivation among nurses, as this would improve the quality of healthcare services. If all the conditions of the workplaces were met, then the quality of the health service would not be left out (11).

Participants responded with the lowest rate of agreement to the statement "The process of training nurses is simple and easy". It is known that the job of a nurse is extremely difficult and demanding, and also one of the most humane in the world. In order to be able to create a professional identity and provide adequate care to patients, it is necessary to receive continuous, i.e. lifelong, education. Education programs should be adapted and accessible to everyone, and it is necessary to strive to create a supportive work environment that will enable to apply acquired knowledge and skills in practice.

The aim of the introduction of specialization is to train nurses to independently manage the processes applied in the health system, based on modern health protocols and guidelines. In this way, the previously described problem of lack of autonomy in the work of the nursing profession is successfully overcome. In the analysis of problems or obstacles when making decisions about specialization, the research results showed that nurses noticed certain difficulties in gaining autonomy due to limited powers and responsibilities in the existing organization of the health system. The introduction of specialization, however, can only be a step towards autonomy and the only way to change the perceived and real limitations of the current system in the long term.

Finally, it is important to mention certain concerns that have been raised in scientific and professional circles regarding the trend of specialization in nursing. The concern mainly stems from the fear that a high degree of specialization will potentially threaten the traditional holistic role of nurses in providing

health care to patients, that is, that the approach to nursing care will become significantly narrower and more fragmented (12). The results of the conducted research confirm that the participants themselves express certain concerns about the reduced possibility of employee migration between different departments. This fear, however, is not realistic because it is not realistic to expect that all available nursing personnel will decide to specialize.

Conclusion

The largest number of participants believe that specialization in the nursing profession can lead to an increase in the quality of service, and the main reason for specialization is a higher level of knowledge in a very specific field of work. Also, the largest number of participants intend to continue their education, but most of them are not familiar with the possibilities of specialization within the profession.

Based on the hypothesis testing process, we conclude that the attitude of nurses towards specialization does not differ statistically significantly depending on the level of education, thus rejecting hypothesis H1. At the same time, no statistically significant connection between workplace and attitude towards specialization was proven, which is the basis for rejecting hypothesis H2.

In line with the trend of specialization in nursing, there has been scepticism and concern that a high degree of specialization will challenge the holistic role of nurses in patient care, narrowing and fragmenting the approach to nursing care. This thesis is not justified because not the entire available nursing staff is motivated to specialize.

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STAVOVI O VAŽNOSTI SPECIJALISTIČKOG USAVRŠAVANJA KOD MEDICINSKIH SESTARA

SAŽETAK

Uvod. Sestrinstvo je profesija na koju se dugo vremena gledalo kao žensku profesiju, pod uputama liječnika i bez vlastitog područja djelovanja. Današnja složenost liječenja i zdravstvene njege zahtijeva specijalizirane i iskusne medicinske sestre kako bi se osigurali kvalitetni ishodi za pacijente. Moderno sestrinstvo suočava se s mnogobrojnim izazovima posebice pandemijama, nefleksibilnim radnim vremenom te nedostatkom samostalnosti u radu. Pitanje je hoće li se transformiranjem sustava zdravstvene skrbi preispitati i uloga medicinskih sestara/tehničara.

Cilj. Prikazati stavove medicinskih sestara/tehničara Opće bolnice Šibensko-kninske županije o potrebi specijalističkog usavršavanja u sestrinstvu.

Metode. U istraživanju je sudjelovalo 146 medicinskih sestara/tehničara zaposlenih u Općoj bolnici Šibensko-kninske županije. Istraživanje se provelo putem anketnog upitnika. Sastojao se od podataka o specijalističkom obrazovanju u sestrinstvu (stav medicinskih sestara/tehničara o potrebi specijalizacije, njihova informiranost o toj temi). Analiza je rađena u statističkom softveru SPSS 25.

Rezultati. U provedenom istraživanju prevladavaju medicinske sestre/medicinski tehničari srednje stručne spreme. U najvećoj mjeri zaposleni su na bolničkom odjelu. Kao glavni motiv za specijalizaciju navode višu razinu znanja u usko specijaliziranom području. Statistički značajno više ispitanika iskazalo

je namjeru nastavka obrazovanja te napretka na profesionalnom planu. Ograničenje u toj namjeri proizlazi iz činjenice da najveći broj ispitanika nije upoznat s programom specijalizacije iako svojim stavovima podržavaju specijalizaciju.

Zaključak. Na temelju provedenog istraživanja dolazi se do rezultata u kojima medicinske sestre / medicinski tehničari Opće bolnice Šibensko-kninske županije podržavaju specijalističko obrazovanje unutar struke. Najveći broj ispitanika smatra da specijalizacija u sestrijskoj struci može dovesti do povećanja kvalitete usluge, a glavnim motivom specijalizacije smatraju višu razinu znanja u usko specijaliziranom području rada. Također, najveći broj ispitanika ima namjeru nastavka obrazovanja, no većina ih nije upoznata s mogućnostima specijalizacije unutar struke.

Odbačene su hipoteze kojima se testiralo razlikuju li se stavovi medicinskih sestara/tehničara o specijalističkom obrazovanju s obzirom na radni staž, razinu obrazovanja i radno mjesto.

Ključne riječi: specijalizacija u sestrinstvu, stavovi medicinskih sestara/tehničara

Health Literacy in Chronic Patients with Epilepsy

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Keywords: patient, epilepsy, measurement, health literacy

Abstract

By reviewing the literature, many authors cite health literacy as one of the strongest predictors of the health status of the individual and the community. According to the World Health Organization from 2000, health literacy represents personal, cognitive and social skills that determine an individual's ability to access information, understand and utilize information to improve and maintain health, and is cited as one of the important public health goals for the 21st century. The purpose of this cross-sectional study was to assess the level of health literacy among patients with epilepsy and to examine the association between health literacy and soft sociodemographic indicators. A structured survey questionnaire modified according to the Compliance Questionnaire for Rheumatology questionnaire and the eHealth questionnaire was used to assess the usefulness of health information obtained through electronic sources. 90 subjects of both sexes were included in the study, and the most represented age group was between 30 and 49 years old. Data analysis included descriptive statistics, and Chi-square test with Fisher's exact correction was used for testing. The results indicated that there is a statistically significant difference between health literacy and certain sociodemographic indicators, and that the younger population recognizes the internet as a useful source of information that helps in making personal health decisions. This study did not prove a statistically significant difference in patients between health literacy and level of education, nor that patients from rural areas have poorer health literacy.

Introduction

Health literacy is an increasingly important topic in the field of public health. It has been defined in many different ways since it was first introduced as a term in 1974 (1). Although the concept of health literacy is defined on the basis of many different theories and methods, the scope has been expanded and supplemented during the last decade. In recent decades, interest in the concept of health literacy has been growing along with an increased emphasis on individual responsibility for health and disease self-management. Health literacy is aimed at empowering a person to take control in preserving their own health by improving access to health information and improving the ability of personal well-being as well as the well-being of people in the environment (2). Health literacy may or may not be related to formal education and a person who functions adequately at home or in the workplace may be illiterate in the health care system environment. There are more than 250 different definitions in the academic literature. Vague and inconsistent interpretations of health literacy are predicted to limit the development of valid and reliable measurements, accurate evaluation and comparison of health literacy initiatives, and synthesis of the evidence which support strategies for improving health literacy (3). One of the widely accepted definitions from the document on health goals developed by the United States National Library of Medicine (USA), Healthy People 2010, defines health literacy as a degree to which individuals can obtain, process, and understand basic health information and services that they need to make appropriate health-related decisions (4). Thus, in the mentioned health goals in the USA, the goal of improving health literacy is mentioned for the first time. The said goal was tasked with improving the health literacy of persons with inadequate or marginal literacy skills and was presented as a 'developmental' goal on the basis that there was no established measure of health literacy (5). In China, a survey called "National Health Literacy Survey" was conducted in which about 80,000 residents aged 15 to 69 from 31 provinces, municipalities and autonomous regions of mainland China were surveyed. The mentioned research indicated that health literacy is better in men than in women, in urban residents compared to residents from rural

areas, in eastern and central parts of China compared to the western areas of China, in those younger than 45 compared to those above 45 years of age, in persons with a higher level of education compared to those with a lower level of education (6). The total level of health literacy measured in 2005 among Chinese residents was only 6.48%. The research was conducted in 2012 and has been conducted every year since then, and it indicates that health literacy is constantly growing; from 8.8% in 2012 to 10.25% in 2015. In 2016, the Chinese government issued its "Healthy China 2030 Action Plan", where the Plan states that the national health literacy rate is intended to be increased to 30%, tripling the current level compared to 2015 (7). Low health literacy is often a significant health challenge in many countries, therefore promoting health literacy is an important public health goal, and interventions to improve health literacy are often a public health priority (4). In 2012, an important survey called "European Health Literacy" was conducted in eight selected EU member states with the aim of measuring "how people access, understand, evaluate and apply information for decision-making in disease prevention and health promotion". The results showed that more than 10% of the total surveyed population had an inadequate level of health literacy, although the percentage varied between 1.8 and 26.9 by country. On the other hand, almost every second citizen was affected when the percentage of limited health literacy (which varied between 29 and 62) was taken into account. The results imply that almost 50% of people are exposed to the risk of inadequate health literacy, which is especially pronounced in certain groups where the risk exceeds 60%. However, variable significance varies depending on the country, so it is advisable to extend the research to other European countries (8). Bobinac et al. state that the Croatian National Health Development Plan for the period from 2021 to 2027 (OG, 147/2021) represents a good platform for health literacy research given that there is no visible health literacy research conducted on a nationally representative sample of the Croatian population. According to the same source, a quantitative study conducted among 1,000 subjects aged 18 and over in 6 regions of the Republic of Croatia indicates that a higher level of health literacy significantly correlates with younger age and higher personal monthly income, it is in a positive and statistically significant correlation with self-assessed health, and a statistically significant correlation was also shown between

response to preventive examinations and early cancer detection programs. The authors state that lower health literacy is reflected in the lower motivation of the individual to appear for a preventive check-up, to prevent obesity and to regularly engage in physical activity. A low level of health literacy is associated with negative consequences for the individual, with poorer health, poorer survival and higher costs of care for patients with various diseases (9). Research by Dukić et al. indicates that health literacy generates various economic effects on the health system and affects the implementation of public health policies. For this reason, research into the factors that influence the health literacy of the population directly contributes to a better understanding of the economic effects (10). Lack of health literacy results in underutilization of preventive resources such as vaccinations and routine check-ups. It affects the patient's understanding of the clinician's instructions about medications which may affect the treatment of chronic conditions such as diabetes, asthma or high blood pressure. Among adults, there is a direct association between low health literacy and poor understanding of preventive care information and access to preventive care services (11). Research by Williams et al. indicates that health literacy is extremely low among older people and that there are problems with using and understanding information related to their health condition (12). Health literacy determines the degree to which an individual can obtain, process and understand basic health information and services they need to make appropriate health decisions and preserve health (10,13) therefore it includes two entities: *personal health literacy* - the degree to which individuals have the ability to find, understand, and use information and services to make health-related decisions and actions for self and others. *Organizational health literacy* - the degree to which organizations equally enable individuals to find, understand, and use information and services to make health-related decisions and actions for themselves and others (14). An important area of health literacy involves the use of more advanced cognitive, literacy and social skills. These skills can be used for participation in different health activities, understanding different forms of health messages and application of health information in changing circumstances (8).

Epilepsy is one of the most common neurological disorders in the world, affecting approximately 7.1 per 1,000 people. Large epidemiologic studies reveal

that the health burden of epilepsy includes educational attainment, lower annual income, and overall poorer health. A significant number of people with epilepsy also experience a high burden of negative health events (NHEs), including seizures, accidents and visits to the hospital. Non-adherence to prescribed medication, inadequate social support and mental health illnesses contribute to poor treatment of epilepsy and NHEs (15). As with other chronic health conditions, low health literacy is a barrier to optimal outcomes among people with epilepsy. In their research, Bautista et al. indicate that patients with epilepsy who have limited health literacy do not necessarily have worse seizure control but have lower QOLIE-10 quality of life scores (16). Scrivner et al. later extended this by finding that a 1%-increase in health literacy was associated with a 6.61-point increase in QOLIE-10 in patients with treatment-resistant epilepsy (17). The programmes that increase the level of social support, improve health literacy, and improve quality of life can also help reduce patient stigmatization (18). Research conducted by Elliott and Shneker indicates that people with epilepsy do not have a solid understanding of the basic information about the condition, including knowledge of their diagnosis, seizure triggers, specific types of seizures, the purpose and potential side effects of anti-seizure medications, safety, concerns, risks and the potential consequences of seizures. The same source states that 30% of subjects believe that epilepsy is an infectious disease or a type of mental disorder. Some of these misinformation may have affected personal safety; for example, 41% of people with epilepsy believe something should be put in the mouth of a person having a seizure, 25% think women should stop taking medication when pregnant, and 25% believe it is safe to drive if they double the dose of medication before driving, if they do not drive alone or if they stop when they feel a seizure (19). A study on the relationship between health literacy and outcomes in patients with epilepsy included in a self-management intervention indicates that a lower level of education and lower income are significantly associated with poorer health literacy ($p < 0.001$ and $p = 0.03$) (20).

Although there are a limited number of studies specifically investigating the association between health literacy and outcomes such as seizures in patients with epilepsy, Paschal et al. in their research indicate that higher results of health literacy among parents

whose children suffer from epilepsy are associated with a lower number of missed doses of medication and the occurrence of epileptic seizures (21). When children lack knowledge about epilepsy, they are more likely to be worried and have more negative attitudes on epilepsy (22). Moreover, when parents of children with epilepsy lack adequate knowledge or have inaccurate beliefs about epilepsy, they may develop negative attitudes and lowered expectations of their children. Epilepsy sufferers and their family members may have many fears when the diagnosis is made. The onset of epilepsy during childhood can be particularly frightening, and seeing seizures can lead parents to believe that their child's condition is life-threatening (23). Children and adults with epilepsy also fear that mental health impairment, injury or death may occur. To manage these fears and prevent unnecessary anxiety, patients need complete and accurate information about the comorbidities and mortality risks associated with epilepsy, including sudden unexpected death in epilepsy, suicide, risks of seizure-related injuries, and long-term seizure risks such as status epilepticus.

Aim

The main aim of this paper is to assess the health literacy in chronic patients, primarily those suffering from epilepsy.

The specific aims of this paper are to assess:

- Whether there is a greater association of health literacy in people who live alone or who have a family.
- Whether there is a greater health literacy with regard to the subject's place of residence.
- Whether there is a better health literacy in people with higher education.

The following hypotheses were established:

- H1 - Health literacy is better in patients who are married.
- H2 - Patients from rural areas have worse health literacy than patients living in urban areas.
- H3 - People with a higher level of education show greater health literacy.

Methods

Design

For the type of study, the simplest form of cross-sectional study was chosen.

Participants

The study was conducted between 1 March and 30 May 2022. A total of 90 subjects of both sexes participated in the study, with a higher proportion of women, 79 (87.8%), and of all age groups, with the largest proportion of people aged 30-49, 51 of them (56.7%).

Statistics

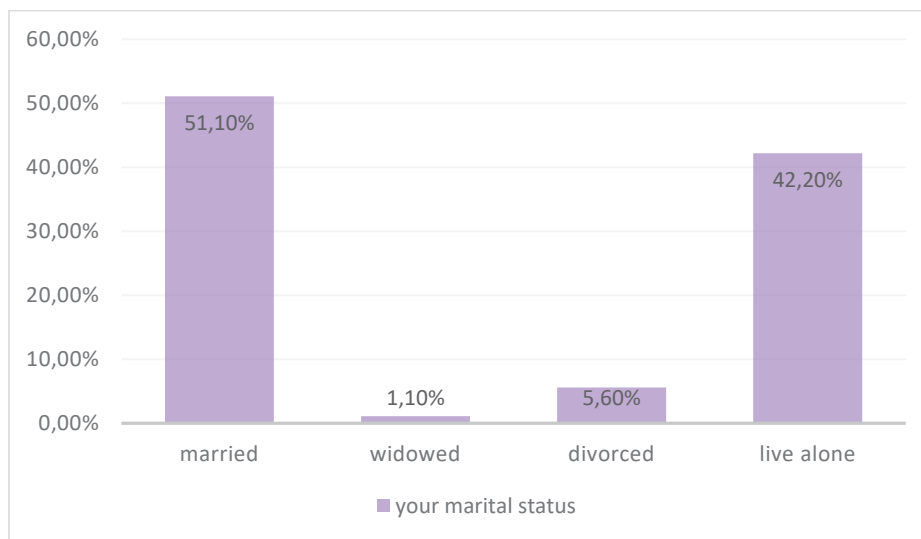
The study was conducted by subjects filling out a questionnaire. Consent was requested and obtained from the Croatian Epilepsy Association to conduct the study. Members of the Epilepsy Association participated, and the study was completely anonymous and voluntary. The subjects were offered an instrument (survey questionnaire) that they received through the Epilepsy Association Facebook page, with an explanation of the goal and purpose of completing the questionnaire. Descriptive statistics were used for data analysis, and the obtained data were processed using the Microsoft Office Excel programme. The Chi-square test with Fisher's exact correction was used to test the difference in the observed questions with regard to the sociodemographic indicators of the subjects. The health literacy of the subjects was also tested in the same way.

Instrument

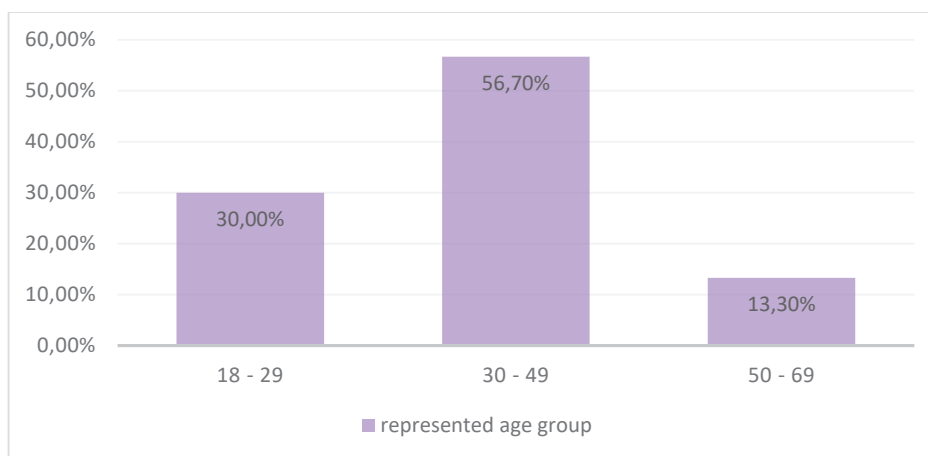
The survey questionnaire was modified and personally compiled from a total of 34 questions/statements. The first part of the questionnaire was related to socio-demographic indicators: education, sex, work status, age, marital status, place of residence and a question about the type of epilepsy the patient was diagnosed with. For the type of epilepsy, answers were offered according to the ICD - medical classification of diseases, where each subject could state what type of illness they are suffering from. The questions from the second part of the question-

naire refer to the self-assessment of health literacy. Questionnaires and recommendations for measuring health literacy were used to create the second part of the questionnaire (24-26). The translated Compliance Questionnaire for Rheumatology (CQR5) (25) was used to create and define the first few questions/statements (1-16), which was adapted for all patients with chronic diseases, and for the other questions/statements related to the ability to search, find, understand and evaluate health information from electronic sources and apply the acquired knowledge to solve a health problem, the

eHealth questionnaire on health literacy was used. Answers to the questions were scored using the Likert scale where: 1 meant completely agree, 2 - partially disagree, 3 - neither agree nor disagree, 4 - partially agree, 5 - completely agree. It should be noted that the answers to only two items about the usefulness of internet information in decision-making were scored in such a way that: 1 meant not important at all, 2 - not important, 3 - uncertain, 4 - important and 5 - very important. It was possible to mark only one answer to each question.



Graph 1. **The distribution of data for the subjects' marital status**



Graph 2. **The distribution of data for the subjects' age**

Results

In the conducted study on health literacy, N=90 subjects participated with the following diagnoses about the type of illness that the subjects themselves could confirm out of all those offered: epilepsy N=52; epilepsy with generalized seizures N=16; epilepsy with partial seizures N=12; epilepsy of known cause N=7 and epilepsy of unknown cause N=3. The fact that not a single survey was returned without a selected diagnosis should indicate that people are knowledgeable about the type of illness they are suffering from.

As for the socio-demographic indicators of the subjects, the results indicate that most of the subjects were female N=79 (87.8%), while N=11 (12.2%) subjects were male. The most represented age group of subjects was between the ages of 30 and 49, N=51 subjects (56.7%), while there were no subjects aged 70 and over (graph 2). The distribution of results on

the level of education indicates that N=43 (47.8%) of the subjects finished secondary school, while a slightly higher number of subjects N=47 (52.2%) have an associate's or bachelor's degree. The largest number of subjects live in an urban area N=53 (58.9%). Graph 1 shows that most subjects are married N=46 (51.1%) i.e. that N=38 (42.2%) of them live alone.

The following is Table 1 with descriptive indicators for the observed questions, displayed frequencies and percentages, arithmetic mean and standard deviation, only for those questions for which the smallest and largest values of the arithmetic mean of the subjects' answers were recorded.

In the first eight questions on health literacy, the highest value of the arithmetic means of the subjects' answers is recorded for the question: *I understand the way of taking the medicine prescribed for me*, where the arithmetic mean of the subjects' answers is 4.86, while the standard deviation is 0.49, and for the question: *I understand the importance of taking the prescribed medicine*, where the arithmetic

Table 1a. **Self-assessment of health literacy (first group of questions)**

		N	%	\bar{x}	Sd
I understand the way of taking the medicine prescribed to me	Completely disagree	0	0.0		
	Partially disagree	1	1.1		
	Neither agree nor disagree	2	2.2		
	Partially agree	6	6.7		
	Completely agree	81	90		
	Total	90	100	4.86	0.49
I understand the importance of taking the prescribed medicine	Completely disagree	0	0		
	Partially disagree	3	3.3		
	Neither agree nor disagree	1	1.1		
	Partially agree	7	7.8		
	Completely agree	79	87.8		
	Total	90	100	4.80	0.62
I am able to decide independently about my method of treatment and/or diagnostics	Completely disagree	10	11.1		
	Partially disagree	11	12.2		
	Neither agree nor disagree	16	17.8		
	Partially agree	17	18.9		
	Completely agree	36	40		
	Total	90	100	3.64	1.40

tic mean of the subjects' answers is 4.80, while the standard deviation is 0.62.

The lowest value of the arithmetic means of the subjects' answers is recorded for the question: *are you satisfied with your job*, where the arithmetic mean of the subjects' answers is 3.28, while the standard deviation is 1.46, and for the question: *I am able to decide independently about my method of treatment and/or diagnostics* the arithmetic mean of the subjects' answers is 3.64, while the standard deviation is 1.40.

36 (40%) of the subjects agree with the statement: *I understand all the information and support I receive from health service providers*, while the lowest number of subjects who partially disagree with that statement is 7 (78%). 38 (42.2%) subjects completely agree with the statement: *I understand all the terms related to my condition/illness*, while only one subject completely disagrees with that statement.

36 of them (40%) partially agree that they have enough information to actively manage their health, while at least 7 of them (7.8%) partially disagree with that statement.

76 (84.4%) subjects completely agree that they understand the dosage instructions and possible side effects written on the medicine, while only 1 subject partially disagrees with this statement. For the statement: *I am able to read and interpret all terms related to my illness and the therapy I take*, the highest number of subjects who completely agree is 43 (47.8%), while the lowest number of subjects who partially disagree is 4 (4.4%).

Also, by analysing the results of individual items on health literacy, it can be observed that the higher value of the arithmetic means of the subjects' answers is recorded for the question: *I understand the need for preventive programmes (early detection of illness)*, where the arithmetic mean of the subjects' answers is 4.52, while the standard deviation is 0.85, and for the question: *I believe that I am able to find good and valid information about health and health maintenance*, where the arithmetic mean of the subjects' answers is 4.11, while the standard deviation is 0.90.

The lowest value of the arithmetic mean of the subjects' answers is recorded for the question: *I believe*

Table 1b. **Self-assessment of health literacy (second group of questions)**

		N	%	\bar{x}	Sd
I understand the need for preventive programmes (early detection of illness)	Completely disagree	1	1.1		
	Partially disagree	3	3.3		
	Neither agree nor disagree	6	6.7		
	Partially agree	18	20		
	Completely agree	62	68.9		
	Total	90	100	4.52	0.85
I believe that I am able to find good and valid information about health and health maintenance	Completely disagree	1	1.1		
	Partially disagree	4	4.4		
	Neither agree nor disagree	14	15.6		
	Partially agree	36	40		
	Completely agree	35	38.9		
	Total	90	100	4.11	0.90
I believe in the effectiveness of every product that contributes to health	Completely disagree	5	5.6		
	Partially disagree	17	18.9		
	Neither agree nor disagree	36	40		
	Partially agree	17	18.9		
	Completely agree	15	16.7		
	Total	90	100	3.22	1.11

in the effectiveness of every product that contributes to health, where the arithmetic mean of the subjects' answers is 3.22, while the standard deviation is 1.11.

27 (30%) subjects partially agree with the statement: *I understand the information I received about my illness/treatment without anyone's help*, while the lowest number of subjects who completely disagree with that statement is 3 (3.3%). 33 (36.7%) subjects partially agree with the statement: *I think that healthcare workers provide information clearly and comprehensibly*, while the lowest number of subjects who completely disagree with that statement is 7 (7.8%).

37 of them (41.1%) completely agree that they are able to find social support for health maintenance on their own, while at least 6 (6.7%) do not completely agree with this statement. Equally, the results show that the highest number of subjects who completely agree with the statement that they are able to evaluate health information by themselves is 36 (40%), and the lowest number of subjects who partially agree with that statement is 5 (5.56%). Interestingly, the highest number of subjects, 36 (40%) of them, neither agree nor disagree with the statement: *I believe*

in the effectiveness of every product that contributes to health.

When measuring self-assessment of health literacy using electronic sources, the following results were obtained for the question: *how useful do you think the internet is in helping you make decisions about your health* - the most subjects, 40 (44.4%) of them, think that the internet is an unsafe source, while 37 (41.1%) subjects believe that the internet is a useful source in making decisions about health. The arithmetic mean for the given question is 3.52 with a standard deviation of 0.77. For the question: *how important is it to be able to access health resources on the internet*, the arithmetic mean is 3.96 with a standard deviation of 0.86, and 45 (50%) subjects consider this possibility important.

The following is Table 2 with descriptive indicators for the observed questions, displayed frequencies and percentages, arithmetic mean and standard deviation, only for those questions for which the lowest and highest values of the arithmetic mean of the subjects' answers were recorded.

Table 2. Self-assessment of health literacy using electronic resources

		N	%	\bar{x}	Sd
I know how to find useful health resources on the internet	Completely disagree	3	3.3		
	Partially disagree	5	5.6		
	Neither agree nor disagree	21	23.3		
	Partially agree	28	31.1		
	Completely agree	33	36.7		
	Total	90	100	3.92	1.06
I know how to use the internet to answer my questions related to health	Completely disagree	1	1.1		
	Partially disagree	5	5.6		
	Neither agree nor disagree	21	23.3		
	Partially agree	32	35.6		
	Completely agree	31	34.4		
	Total	90	100	3.97	0.95
I am confident in using information from the internet to make decisions regarding health	Completely disagree	4	4.4		
	Partially disagree	15	16.7		
	Neither agree nor disagree	40	44.4		
	Partially agree	23	25.6		
	Completely agree	8	8.9		
	Total	90	100	3.18	0.97

The highest value of the arithmetic means of the subjects' answers is recorded for the question: *I know how to use the internet to answer my questions related to health* where the arithmetic mean of the subjects' answers is 3.97, while the standard deviation is 0.95, and for the question: *I know how to find useful health resources on the internet* the arithmetic mean of subjects' answers is 3.92, while the standard deviation is 1.06.

From this set of questions, the lowest value of the arithmetic means of the subjects' answers is recorded for the question: *I am confident in using information from the internet to make decisions regarding health*, where the arithmetic mean of the subjects' answers is 3.18, while the standard deviation is 0.97.

Testing the difference in the observed questions with regard to the subjects' socio-demographic indicators

With the aim of comparing all observed questions/statements, testing was performed with regard to the *level of education* of the subjects (secondary

school, associate's degree, or bachelor's degree), where the Chi-square test (with Fisher's exact correction) was used, whereby it was observed that **$p > 0.05$** in all observed cases, which means that there is no statistically significant difference with regard to the subjects' *level of education*.

By comparing all observed questions/statements, testing was also performed with regard to the subjects' status (employment, retirement, unemployment), using the Chi-square test (with Fisher's exact correction), whereby a level of significance in the question: *I understand the received information about my illness/treatment without anyone's help, I am able to evaluate information related to health* was observed, where $p < 0.05$, which means that a statistically significant difference was observed with regard to the subjects' work status (Table 3).

If we look at the significance level of the question: *How useful do you think the internet is in helping you make decisions about your health*, it can be observed that $p < 0.05$, which means that a statistically significant difference was observed with regard to the subjects' age, where the subjects aged 18-29 to

		What is your status						p^*
		I am employed		I am retired		I am unemployed		
		N	%	N	%	N	%	
I understand the received information about my illness/treatment without anyone's help	Completely disagree	2	3.6	0	0	1	3.2	0.027
	Partially disagree	12	21.8	1	25	4	12.9	
	Neither agree nor disagree	6	10.9	2	50	13	41.9	
	Partially agree	21	38.2	0	0	6	19.4	
	Completely agree	14	25.5	1	25	7	22.6	
	Total	55	100	4	100	31	100	
I am able to evaluate information related to health	Completely disagree	0	0	0	0	0	0	0.028
	Partially disagree	5	9.1	0	0	0	0	
	Neither agree nor disagree	7	12.7	0	0	13	41.9	
	Partially agree	20	36.4	2	50	7	22.6	
	Completely agree	23	41.8	2	50	11	35.5	
	Total	55	100	4	100	31	100	

*Fisher's exact test

Table 4. Comparison with regard to the observed age groups

		What age group do you belong to						p*
		18 - 29		30 - 49		50 - 69		
		N	%	N	%	N	%	
How useful do you think the internet is in helping you make decisions about your health	Not useful at all	0	0	1	2	0	0	0.033
	Not useful	1	3.7	3	5.9	0	0	
	Uncertain	5	18.5	27	52.9	8	66.7	
	Useful	17	63	16	31.4	4	33.3	
	Very useful	4	14.8	4	7.8	0	0	
	Total	27	100	51	100	12	100	

*Fisher's exact test

a much greater extent state that the internet is useful and very useful. In the other observed questions, no statistically significant difference was observed with respect to the subjects' age.

If we look at the significance level of the question: *I understand the importance of taking the prescribed medicine* it can be observed that $p < 0.05$, which

means that a statistically significant difference was observed with regard to the subjects' marital status, whereby 93.5% of subjects who are married completely agree.

Furthermore, if we look at the significance level of the question: *How useful do you think the internet is in helping you make decisions about your health*

Table 5. Comparison with regard to marital status

		Your marital status								p*
		Married		Widowed		Divorced		Living alone		
		N	%	N	%	N	%	N	%	
I understand the importance of taking the prescribed medicine	Completely disagree	0	0	0	0	0	0	0	0	0.003
	Partially disagree	1	2.2	0	0	1	20	1	2.6	
	Neither agree nor disagree	0	0	0	0	1	20	0	0	
	Partially agree	2	4.3	0	0	2	40	3	7.9	
	Completely agree	43	93.5	1	100	1	20	34	89.5	
	Total	46	100	1	100	5	100	38	100	
How useful do you think the internet is in helping you make decisions about your health	Not useful at all	1	2.2	0	0	0	0	0	0	0.025
	Not useful	2	4.3	0	0	0	0	2	5.3	
	Uncertain	27	58.7	0	0	4	80	9	23.7	
	Useful	12	26.1	1	100	1	20	23	60.5	
	Very useful	4	8.7	0	0	0	0	4	10.5	
	Total	46	100	1	100	5	100	38	100	

*Fisher's exact test

Table 6. Comparison with regard to the subjects' place of residence

		Your place of residence						p*
		City		Countryside		Suburban		
		N	%	N	%	N	%	
I have enough information to actively manage my health	Completely disagree	0	0	0	0	0	0	0.018
	Partially disagree	5	9.4	0	0	2	15.4	
	Neither agree nor disagree	4	7.5	6	25	5	38.5	
	Partially agree	26	49.1	7	29.2	3	23.1	
	Completely agree	18	34	11	45.8	3	23.1	
	Total	53	100	24	100	13	100	

*Fisher's exact test

it can be observed that $p < 0.05$, which means that a statistically significant difference was also observed with regard to the subjects' marital status. No statistically significant difference was observed in the other observed questions.

If we look at the significance level of the question: *I have enough information to actively manage my health* it can be observed that the value of Fisher's exact test is $p < 0.05$, which means that a statistically significant difference was observed with regard to the subjects' place of residence, with 45.8% of the subjects from the countryside completely agreeing. For the other observed questions, no statistically significant difference was observed with regard to the subjects' place of residence.

Discussion

A total of 90 subjects diagnosed with epilepsy, of both sexes and all age groups, members of the Croatian Epilepsy Association, participated in the study. Out of a total of 90 subjects, 79 of them declared that they are of the female gender, while 11 subjects declared that they are members of the male gender, which means that 87.8% of the subjects were female and 12.2% were male. In addition to basic literacy and reading ability, the overall assessment of health literacy emphasizes the importance of assess-

ing the ability of patients to understand information received verbally, how well they know health topics, and how they navigate a large number of information sources. Based on that, our study also aimed to assess certain determinants of health literacy and their connection with sociodemographic indicators. Analysing the results, it can be recognized that the examined group has the skills related to the proper way and awareness of the importance of taking the prescribed medicine. 76 (84.4%) of the subjects believe that they understand the dosage instructions and possible side effects written on the medicine. The same number of subjects, 76 (84.4%), estimate that they are able to read and interpret all terms related to the illness and the therapy they are taking. Given that these questions showed the highest value of the arithmetic mean, the above indicates that the health literacy of all subjects for these items is at a desirable level, regardless of the examined socio-demographic determinants. On the other hand, the study indicates that the subjects assess a reduced skill in the degree of independence in their method of treatment and/or diagnostics, given that the lowest value of the arithmetic mean of the answer to that question was recorded in the examined group. It is possible that these results are expected, given that it is a chronic neurological illness which, according to the guidelines of the profession, requires an individual approach to treatment, and an illness which can be completely put under control i.e. long-term or permanent remission with medication (27). It is important to educate and strengthen the patient's health literacy about the method of treatment, and the aforementioned guidelines emphasize that the

treatment begins with educating the patient about the prognosis and possible outcomes of the illness, possible complications, possible side effects, life restrictions, work activities, self-help, etc. Furthermore, our study showed that the subjects partly or mostly agree with the statements related to their understanding of information, the support they receive from health care providers, and their understanding of the terms related to their condition/illness. Only one person completely disagrees, and a smaller number of subjects partially disagree with those statements. If we look for an answer to the question whether healthcare professionals carry out sufficient education that makes it easier for patients to understand services and information, and analyse the answers to the question *"I think that healthcare workers provide information clearly and comprehensibly"*, we can determine that there is still room and a need to strengthen the provision of comprehensible and clear information, given that the answers to that question are equally dispersed from completely disagree to completely agree. As the arithmetic mean of the answers of the interviewed persons showed a high value to the following questions, through our results we can determine that the participants showed an understanding of the needs for preventive programmes (early detection of illness) and the present skills of finding good and valid information about health and maintaining health (Table 1b). Namely, we can be satisfied with the obtained results of these observed items, starting from the fact that understanding how patients value different aspects of public health preventive programmes and how they prioritize when it comes to their health is of great importance, and we believe that our subjects' understanding is an important health resource.

The lowest value of the arithmetic means is recorded in the subjects' answers to the question about confidence in the effectiveness of each product that contributes to health, which can be connected to health literacy and the individual's ability to select products which are on the market, and often as an over-the-counter medicine. Each product does not unconditionally contribute to health, therefore the effectiveness depends on a professional assessment of the justification of using a product, prescribed by an expert.

The levels of health literacy according to Freebody and Luke are: the first is basic literacy, the second is communicational or interactive literacy, those skills

that are related to finding and browsing different sources of information and applying those information in a health context, and the third is related to critical reflection on the found information (28). The Internet is an important source of information, and terms from IT literacy are also used for health literacy. Today individuals seek information when they become aware of their own gaps in knowledge when dealing with health and other problems. With this study, we wanted to investigate the information behaviour of our subjects and the trust they have towards certain types of information resources through several questions. The results indicate a high value of the arithmetic means of the subjects' answers to the questions: *"I know how to use the internet to answer my questions related to health"* and *"I know how to find useful health resources on the internet"*, therefore it could have been assumed that the subjects use the internet, as we found them through social networks and the internet, and in this way they filled out the survey questionnaire. It is certain that the results of these questions were influenced by the distribution itself, which was via the internet, which left out the part of patients who do not use the internet, and probably the physical distribution of the survey questionnaire would have ensured a more representative sample. Likewise, one of the limitations of this study is the fact that the subjects are patients largely from the younger age group, with an assumption that they use more and have better skills for using IT systems, that they are treated in an out-patient setting and not at a hospital, and that they are members of an Association which primarily provides support for its members. Since membership is voluntary, our subjects belong to the group of patients motivated to control their health and treat their illness. Research shows that all of the above is positively correlated with health literacy.

As our specific goals were to compare the health literacy of the examined group with socio-demographic indicators, we tested the difference in the observed questions from the survey with regard to the subjects' socio-demographic indicators, using the Chi square test (with Fisher's exact correction, where we $p > 0.05$ meant that there was no statistically significant difference, and $p < 0.05$ that a statistical difference was observed).

The study showed that there is no statistically significant difference with regard to the level of education,

while statistical significance was observed for the question about the information received about one's illness/treatment and understanding it without anyone's help with regard to the subjects' employment status, where the highest number of those who declared themselves neutral on that question (neither agree nor disagree) was among the unemployed - 13 (41.9%). Also, there is statistical significance for the question about the state of independent assessment of health information with regard to the subjects' employment status, where the majority of those who neither agree nor disagree are unemployed (Table 3).

As already mentioned in the discussion, it was to be expected that the younger population is more inclined to use the internet and social networks, so the significance and statistically significant difference with regard to the subjects' age was shown in the question about the opinion on usefulness of the internet in helping to make decisions about one's health, with the subjects aged 18-29 citing the internet as a useful and very useful resource to a much greater extent (Table 4).

As for the category of marital status, in the survey we classified these indicators into four groups (married, widowed, divorced and living alone). Analysing the results, we determined that there are statistically significant differences in the questions about understanding the use of prescribed medicines and the question about the usefulness of the internet in helping to make decisions about personal health with regard to these categories. 46 (93.5%) married subjects answered that they completely agree to the question about taking medicines, although 38 (89.5%) of those who live alone gave the same answer to the same question. The number of subjects who are widowed or divorced was incomparably smaller, i.e. only 6 people, and we realised that it is difficult to assert that there is truly a statistically significant difference with regard to the subjects' marital status. For the same reasons, although a statistically significant difference was obtained because the test showed $p < 0.05$, we cannot confirm the significance between the marital status and the subjects' answer that the internet is useful in helping to make decisions about health. In Table 5, it can be seen that the answers of both those who are married and those who live alone to this question are mostly unsafe and useful. 27 (58.7%) of those who are married think that it is unsafe, and those who live alone think more that it is useful.

If the results are compared with regard to the subjects' place of residence, the level of significance in the question: "*I have enough information to actively manage my health*", it is observed that the value of the test is $p < 0.05$, which means that a statistically significant difference was also observed with regard to the subjects' place of residence, with 45.8% of the subjects from the countryside completely agreeing, and 49.1% of the subjects from living in cities partially agreeing with that statement.

According to Kickbusch, health literacy is not only an individual's trait but a key determinant of population health which is influenced by many factors, and as a measure of the outcome of health promotion and disease prevention activities, and as such is becoming increasingly important for social, economic and health development (29). Thus, in the objectives of this paper, three hypotheses were set, with the aim of determining the connection of certain factors with health literacy in the studied population. According to the obtained results and the presented statistical processing, it can be determined that the set hypotheses were rejected.

- H1** - We do not confirm that health literacy is better in married patients.
- H2** - Patients from rural areas have poorer health literacy than patients living in urban areas - this hypothesis was not confirmed.
- H3** - Persons with a higher level of education show greater health literacy - based on the results obtained, the hypothesis was rejected.

Although there are limitations to this study, for example in the number of subjects and the method of data collection, the use of a self-made questionnaire with selected questions for the assessment of health literacy, it can still serve as a platform for subsequent research which would include a larger number of subjects/patients and those undergoing hospital treatment, creation of a rapid assessment model, literacy of other important components in the treatment of epilepsy, such as compliance with the treatment, satisfaction with care and support for the patient, use of health resources, and for example, determining the impact of health literacy on the quality of life, etc.

Conclusion

The results of this study conducted on patients suffering from epilepsy indicate satisfactory health literacy, they also indicate that health literacy is not influenced by the level of education, marital status, and that there is no statistical significance whether a person lives in a rural or urban area.

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ZDRAVSTVENA PISMENOST KOD KRONIČNIH BOLESNIKA OBOLJELIH OD EPILEPSIJE

SAŽETAK

Pregledom literature mnogi autori zdravstvenu pismenost navode kao jedan od najjačih prediktora zdravstvenog stanja, pojedinca i zajednice. Prema podacima Svjetske zdravstvene organizacije iz 2000., zdravstvenu pismenost predstavljaju osobna, kognitivna i društvena umijeća koja određuju sposobnost pojedinca da dođe do informacije te razumije i upotrebljava informacije kako bi unaprijedio i održao zdravlje, te se navodi kao jedan od važnih ciljeva javnog zdravlja za 21. stoljeće. Svrha ove studije presjeka bila je procijeniti razinu zdravstvene pismenosti među bolesnicima oboljelima od epilepsije i ispitati povezanost između zdravstvene pismenosti i mekih sociodemografskih pokazatelja. Primijenjen je strukturirani anketni upitnik modificiran prema upitniku Compliance Questionnaire for Rheumatology (CQR5) i upitniku eHealth za procjenu korisnosti zdravstvenih informacija dobivenih putem elektroničkih izvora. U studiju je bilo uključeno N = 90 ispitanika oba spola, a najzastupljenija dobna skupina bila je u dobi od 30 do 49 godina. Analiza podataka uključivala je deskriptivnu statistiku, a za testiranje je primijenjen hi-kvadrat test s Fisherovom egzaktnom korekcijom. Rezultati su ukazali da postoji statistički značajna razlika između zdravstvene pismenosti i nekih sociodemografskih pokazatelja te da mlađa populacije prepoznaje internet kao koristan izvor podataka koji pomažu pri donošenju osobnih odluka o zdravlju. Ovim istraživanjem nije dokazana statistički značajna razlika kod bolesnika između zdravstvene pismenosti i stupnja obrazovanja, kao ni da bolesnici iz ruralnih krajeva imaju lošiju zdravstvenu pismenost.

Ključne riječi: bolesnik, epilepsija, mjerenje, zdravstvena pismenost

Specificities of Nursing Care of Conjoined Twins

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Abstract

Conjoined ("Siamese") twins are one of the rarest congenital anomalies with an incidence of about 1.47 per 100,000 births in the Western world. This rare natural phenomenon is present in only 1% of monozygotic twins, i.e., 0.05% of live births. Most of them are stillborn (40-60%) or die early in life. The majority of live births are female (75%), which is why the female karyotype is considered to be beneficial in terms of survival. Conjoined twins are created when the zygote begins to separate after 13 days post-fertilization, at a time when the so-called embryonic disc has already been formed. Instead of producing two separate embryos, this late separation causes incomplete separation of the embryos. The name comes from conjoined twin brothers Chang and Eng Bunker, who were born in Siam. Surgical separation of conjoined twins is usually a very demanding and complex procedure, and often not even possible. Survival after separation depends on the type of connection.

This paper presents the case of conjoined twins who were born at 33 weeks. At 11 weeks of pregnancy, the doctors suspected that the twins were joined ventrally (omphalopagus - twins joined at the abdomen). The diagnosis was confirmed by fetal MRI at 21 weeks. Separation was indicated at the age of 45 days and a combined body weight of 4,700 g. Long postoperative recovery and treatment lasted three months and was complicated by infections and problems with the healing of the surgical wound of one of the twins. Treatment and recovery required a multidisciplinary approach and a well-educated team of doctors and nurses.

Introduction

Conjoined twins are twins who are physically fused in the womb and consequently at birth. The first mention of conjoined twins dates back to the Neolithic period (1). The most common etiology of conjoined twins is partial fission or secondary fusion. Both of these processes can be used to explain the embryological and anatomical findings observed in conjoined twins (2). Conjoined twins are the result of axis splitting or duplication that occurs after 13 days post-fertilization. They are described according to the site of fusion and are a rare atypical presentation of symmetric monozygotic twin pregnancies. They are of the same sex and karyotype. They are more common in women with a ratio of men to women of 1:3. They are the result of incomplete embryo splitting into two separate twins after 12 days post-fertilisation. Conjoined twins are more often female. They are classified according to the point of fusion: ventral-rostral, caudal, lateral and dorsal. Among conjoined twins, Thoracophagus is the most common type (3,4). Traditional healthcare strategies may require modification to meet the unique care needs of conjoined twins. Areas of focus include ensuring privacy, designing appropriate housing units to meet space and equipment needs, staffing considerations, and adaptations to typical neonatal intensive care interventions. Caring for conjoined twins is a complex process and the role of the nurse has an important impact on the overall outcome. Even basic and

routine nursing tasks must be adapted to meet the needs of these unique patients (5).

Conjoined twins

Conjoined twins are a rare embryological developmental disorder of unclear etiology. The condition itself implies malformations and is associated with secondary changes associated with abnormally connected organs and the superimposed effects of abnormal hemodynamics. The proposed defect mechanisms cannot explain the changes in the normal developmental process, whereby a pair of monozygotic twins do not separate from each other and continue their normal embryological development (6). The rarity and complexity of this condition present a challenge for prenatal planning and postnatal care. Medical, imaging, and surgical advances have led to earlier, more accurate depictions of anatomy, and as a result, have allowed more time for the team of professionals to prepare for their complex care (7).

Historical background

Since ancient times, conjoined twins have captured the attention and fascination of people around the world. Over the centuries they have been worshipped as gods, feared as monsters, and paraded before curious crowds for entertainment. They were integrated into the myths and legends of many ancient civilizations, especially Janus, the ancient Roman god of beginnings and ends. For centuries, people considered conjoined twins, as well as children with birth defects, to be a bad omen or a sign of God's wrath (8). Probably one of the first documented cases was



Figure 1. "Siamese twins" - brothers Chang and Eng

Source: <https://www.abc.net.au/news/2016-11-14/chang-and-eng-bunker-the-original-siamese-twins/7992942>

a pair of conjoined twins born in Isle-Brewers, England, joined at the back from the middle of the chest to near the lumbar region part. Anecdotal reports of live conjoined twins in European medical history date back more than 1,000 years, but the first well-known case was not documented until 1811 when 2 boys - Chang and Eng - were born in Bangkok, Thailand, attached at the sternum and they were called "Siamese twins" (Figure 1). As they travelled the world with Barnum's Circus, they consulted with a multitude of doctors. Everyone, including Rudolf Virchow, concluded that separation would be fatal for both of them (9).

Epidemiology

The exact incidence of conjoined twins has not been determined, and the estimated frequency varies in the literature. All conjoined twins are monoamniotic, monochorionic and monozygotic twins. Conjoined twins occur in 1.6% of all human pregnancies, of which 1.2% are fraternal and 0.4% are monozygotic. Monochorionic-monoamniotic twins account for less than 1% of identical twins, and conjoined twins are even rarer, occurring in approximately 1 in 50,000-100,000 and 1:600 live births. Conjoined twins are three times more common in female fetuses than in male fetuses. It is believed that 1 in 40 monozygotic twins fail to separate, producing conjoined twins. There was a reported incidence of 1:14,000 live births in India and Africa and 1:250,000 live births in Europe and the USA, suggesting an increased incidence in the black population (10). More recent studies on the epidemiology of conjoined twins are relatively rare, but the prevalence does not appear to be significantly different (1.02-1.34 per 100,000 births) in Western populations. However, an increased prevalence of 3.27:100,000 births and 2.85:100,000 births was reported in two studies on the Chinese population from the same Surveillance Program at different times (6).

Embryology

The anatomical structure and physiological functioning of the female reproductive system are predisposed for the conception of one embryo which, after implantation, develops into a fetus and is born naturally as a normal newborn at full term. Sometimes, however, various disorders can disrupt this sequence of processes. A special example of such a disorder

is multiple pregnancies, which are often and incorrectly called twin pregnancies because there can be more than two fetuses. Ovulation disorders can lead to the release of several eggs that, when joined with sperm, form independent zygotes and then polyzygotic fetuses. Embryonic regulation is a specific characteristic of early embryo development. It can lead to the development of genetically identical (monozygotic) twins. This phenomenon is not treated as a pathology, especially since further embryonic development, birth and postnatal development are often normal (11). It is now generally accepted that a human embryo can divide and form into monozygotic or identical twins at one of three stages of development. After fission or cleavage, two genetically identical embryos would be expected and after zona lysis, each would implant and develop as two distinct, although genetically identical, embryos (12).

Currently, the generally accepted and prevailing theory that could explain the origin and development of fused fetuses is the fission theory. It is assumed that during gastrulation when the embryo still has the shape of an elliptical disc, the disc spontaneously cleaves incompletely along the cephalocaudal axis. The process of embryonic regulation creates conjoined twins. They are characterized by homologous connection, which means that both individuals share the same organs, e.g., head-to-head or back-to-back. Fragmentation of the embryonic disc and separation of tissue elements can be caused by environmental factors, cell adhesion disorders or increased genetically conditioned apoptosis, i.e., cell death. An alternative theory that explains the origin of conjoined twins is the spherical theory. It is assumed that the embryonic discs, which are formed after the complete cleavage of the embryo in the early stage of development, may have a common yolk sac. The cells that form it can "swim" or "float" on its surface and rejoin, usually endodermally, thus creating ventrally conjoined twins. On the other hand, dorsally conjoined twins are the result of ectodermal fusion due to the approximation of embryonic discs that share a common amniotic cavity at an early stage (11).

Classification

The most common case of conjoined twins is two conjoined children of a similar stage of development. In general, conjoined twins are divided into ventrally fused conjoined twins (approximately 69.3% of cases) and dorsally fused conjoined twins (5.4%).

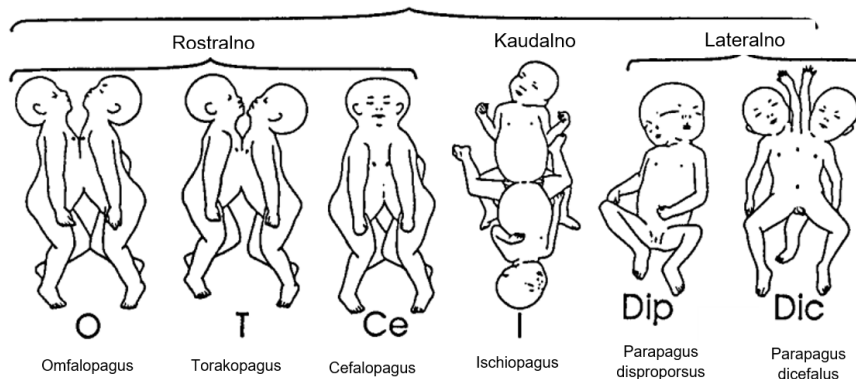


Figure 2. **Ventrally fused conjoined twins**

Source: https://www.researchgate.net/figure/Types-of-twins-according-to-Spencer-O-omfalopagus-T-thoracopagus-Ce-cephalopagus-L_fig2_8432231

The remaining types include connections of a non-specific nature (21.4%) and the so-called parasitic twins (3.9%), i.e., those characterized by significant morphological disproportions. The nomenclature associated with the pathologies observed in the case of joined fetuses is based on the morphology of the connection. Ventrally conjoined twins can be divided into cephalically conjoined, which include thoracopagus (42%), cephalopagus (5.5%) and omfalopagus (5.5%). An example of caudal fusion is ischiopagus (1.8%), and lateral fusion parapagus (14.5%) (Figure 2) (13).

Ventrally fused conjoined twins initially share a common yolk sac that participates in the development of the intestines, liver and pancreas. They usually share a common peritoneal cavity and umbilical cord. Their hearts can be shared or separated depending on the level of fusion. The thoracopagus type is formed by fusion at the cardiac primordium. The connection includes the chest and the upper part of the abdominal cavity. In this case, numerous common organs prevent separation. The cephalopagus type develops by initial fusion on the oropharyngeal membrane at the anterior part of the embryonic disc. After that, it stretches from the top of the head to the navel. In this case, the trunks of both fetuses share the head and chest. The prognosis for their survival and development is very unfavourable (12). The omfalopagus type develops by the fusion of the primordial diaphragm. The connection includes the chest and the upper part of the abdominal cavity. The ischiopagus type is associated with a common cloacal membrane and the development of the hindgut and rectum. It

also includes the musculoskeletal system of the back of the body. Such fusion can also be found in the lower part of the abdominal cavity and the area of the urogenital tract. Fusion usually does not involve critical organs and newborns can be effectively separated. The parapagus type develops by fusion of the anal primordium, often retaining two notochords, and eventually the lower spinal segments. The connection involves the pelvis and torso to varying degrees; there are one or two heads and two faces (13). Dorsally conjoined twins are divided into the following types: craniopagus (3.4%), rahipagus (1.0%) and pygopagus (1%). These twins share a part of the axial nervous system that originates from the neural tube (Figure 3) (7).

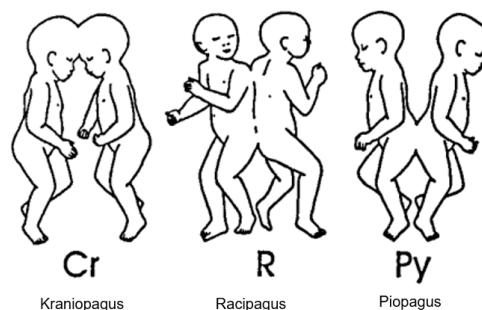


Figure 3. **Dorsally fused conjoined twins**

Source: https://www.researchgate.net/figure/Types-of-twins-according-to-Spencer-O-omfalopagus-T-thoracopagus-Ce-cephalopagus-L_fig2_8432231

The spine and its muscles are common, but there are two abdominal cavities. Umbilical cords are usually separate. The craniopagus type develops with an

initial fusion in the region of the anterior neural foramen that ultimately includes the cranial vault. The rachipagus type develops from the fusion of the central part of the neural tube that includes the spine and its muscles. The pygopagus anomaly is formed by the fusion of the caudal segments of the neural tube in the area of the posterior neural opening and ultimately involves the sacrum and coccyx with the pelvic muscles. It is important to emphasize that all types of conjoined twins have a common etiology (7).

Prenatal diagnosis

Developments in imaging and radiology have enabled physicians to diagnose and assess the extent of fusion at an early developmental stage in most cases of conjoined twins. It is now possible for the medical team to more accurately predict the outcome and adequately counsel families to help them decide whether to continue with the pregnancy or opt for early termination. Prenatal assessment is currently primarily performed using ultrasound, with the addition of colour Doppler imaging and a three-dimensional ultrasound, which help in establishing an accurate diagnosis (8). Currently, prenatal ultrasound is commonly used to diagnose conjoined twin pregnancies and can be performed as early as 12 weeks of pregnancy. However, a detailed scan at 20 weeks gestation gives a reasonable estimate of the extent of the fusion and any other problems. The non-invasive nature and safety of this procedure make it the modality of choice for early in-utero diagnosis. This technique uses the amniotic fluid's ability to act as a buffer during scanning. When appropriate, transvaginal ultrasound is also recommended. According to recent studies, prenatal fetal MRI can add information to help define the exact anomalies and connect anatomies between fetuses, as a result of its higher resolution, lack of ionizing radiation and its non-invasive nature. They are widely used to delineate anatomical details, especially the cardiovascular system. A detailed examination of the heart is particularly important because the prevalence rate of congenital heart abnormalities in conjoined twins is high (14). Correct diagnosis is also an important aspect in planning the obstetric care of conjoined twins, as are the decisions about the method and timing of delivery. Early diagnosis of conjoined twins will then allow for better management including preventing premature birth and allowing the fetuses to continue their normal development. The method of choice for deliver-

ing conjoined twins is a Cesarean section. Needless to say, the more one knows about the twins before the operation, the better the outcome of the separation procedure will be (15).

Treatment

If the diagnosis is made in the first trimester, the twins should be delivered by a Cesarean section at or near the hospital where the separation will take place. However, in many cases, the condition is not discovered until labour is obstructed (16). Conjoined twins fall into one of three groups - namely newborns who do not survive birth (and those who die shortly after birth), infants who survive till elective surgery and infants who require emergency surgery. Elective separation is possible in omphalopagus, pygopagus and some craniopagus, and thoracopagus twins. Separation is not possible with cephalopagus, parapagus and rachipagus twins. Urgent separation may be necessary when there is damage to the connecting bridge (omphalopagus), where one twin threatens the life of the other (complex congenital heart disease, cardiomyopathy, sepsis), when the condition of both twins deteriorates due to hemodynamic and respiratory disorders (typically thoracopagus) or where the condition of one of the twins is incompatible with life (anencephalic, stillborn), and the other has good prospects for survival (17).

As a result of the multiple organ abnormalities of conjoined twins, it is necessary to perform a thorough examination of each organ system. The most critical organ that determines the prognosis of surgical separation is the heart. Parts of the gastrointestinal (GI) system are usually shared in most cases of conjoined twins, except in craniopagus twins. An adequate examination of the digestive tract can be done by applying dyes at a separate time intervals to understand which structures are being divided. Ultrasound, 3D-MRA and radioisotopes can be used for analysis in the presence of a common pancreas and biliary system, which are often found in thoracopagus and omphalopagus twins. Cystoscopy has become a popular approach to examining the genitourinary system in cases involving the common bladder, rectum, and/or vagina. It is also important to assess the kidneys, including their number, location, and degree of fusion. Ultrasound and MRI are commonly used for such purposes. In male twins, joint use of the genitals, scrotum and testicles should be evaluated (18).

During the separation procedure, great attention is paid to anesthesia, breathing and hemostasis. Certain experts are assigned to each twin separately, along with a joint team coordinator. Due to shared circulation, poorer cardiac function, and unpredictability of reactions to drugs, administration of anesthesia during the separation procedure can be difficult. Endotracheal intubation is strongly recommended to maintain adequate respiratory gas exchange. However, it can be difficult to intubate thoracopagus twins (10). Cross-circulation between conjoined twins has significant implications for anesthetic pharmacology and resuscitation. Where cross-circulation is imbalanced, significant end-organ (cardiac, renal, and respiratory) failure can occur. It should also be recognized that the degree of cross-circulation is dynamic and depends on the relative systemic vascular resistance of both twins. Although dosing of anesthetics, antibiotics, and analgesics is often based on weight (using half the combined weight as a standard), effects can be erratic. Induction of anesthesia should be simultaneous since inhalation of volatile substances can cause complete, no or some effect on the other twin.

Heparin dosing before cardiopulmonary bypass may be compromised by unequal flow distribution between the twins. Careful angiographic imaging of the cross-circulation is necessary to assess the fraction of cardiac output shared between twins because the survival of one twin may depend on the circulation of the other (16). Due to the possibility of large blood loss, it is very important to maintain adequate tissue perfusion. Conjoined twins usually have critical energy needs due to significant cardiopulmonary and metabolic abnormalities. Therefore, dextrose and isotonic electrolyte solutions can be administered intravenously. When necessary, palliative procedures including amputations, draining colostomies and ileal conduits are performed. Complications such as arrhythmia, cardiac arrest and vascular thrombosis may occur during surgical procedures. There is also an increased risk of anesthesia complications, hypothermia, and ventilatory failure due to the need for prolonged anesthesia. Greater radiation exposure and a greater need for contrast administration also require careful consideration (19).

After the surgical separation, the twins need intensive treatment and care. They should be transported to intensive care units and constantly monitored for signs of bleeding, hypotension, hypothermia, hypocalcemia, electrolyte loss, hypoxia, and acid-base

imbalance. Cardiovascular, pulmonary and renal functional indicators should be continuously recorded to prevent any complications. Mechanical ventilation may be necessary for twins with severe respiratory distress. A review of the literature indicates that cardiovascular and respiratory failure are still the two major risk factors for twin death after separation. The stress of long-term treatment and surgery puts the twins at risk for infections and delayed wound healing. Therefore, central venous lines should be maintained for rapid access to provide intravenous boluses of fluids, blood, parenteral nutrition, or anesthetics. Additional surgical procedures may be required to repair any other visceral abnormalities (8).

Ethical aspects

Health workers often face ethical dilemmas in their practice. However, conjoined twins bring their own unique set of ethical challenges. Already at the initial diagnosis, the decision to continue or terminate the pregnancy is often difficult. However, the real challenge begins at birth, when the decision is made for or against separation. The main goal of the separation procedure is not only to save lives but also to improve the quality of life of the twins. Except emergencies that require separation, this notion assumes that twins do not have a fulfilling life if they are not separated (10). Cases where there is significant organ sharing, yet two different functioning brains, are philosophically and ethically challenging. This is because they raise questions about a person's identity, whether they are identical to something psychologically or biologically, they force a person to decide whether what matters from an ethical point of view is the biological life of organisms or the existence of consciousness or mind. They raise questions about when, if at all, it is morally acceptable to sacrifice one person to save another. They force you to think about the conditions of organ ownership and the justification of organ removal for transplantation that causes the death of the donor. They raise questions about who should make decisions about life-threatening treatments when patients themselves cannot decide (20). These cases raise serious moral issues about whether surgical separation should be attempted when extensive organ overlap makes the conjoined twins' life prospects poor, but their surgical separation is medically difficult and risks worsening the life prospects of at least one of the twins (14). If the necessary operation is easily performed and without

risk, there is a strong moral reason to perform it, since it is likely to improve the life prospects of the twins even more, since conjoining in all its forms brings some disadvantages, such as reduced privacy and exposure to public opinion. curiosity. Such cases can conditionally be called win-win cases because the life prospects of both twins are improved by separation (21). This case report was conducted with the permission of the parents and in accordance with the guidelines for the safety of persons participating in such research, including the Declaration of Helsinki.

Specificities of nursing care of conjoined twins

The specificities of nursing care of conjoined twins will be shown in the example of the girls born in the 33 weeks of gestation who were admitted to the Department of Neonatology and Neonatal Intensive Care of the Zagreb Clinical Hospital Center 65 minutes after birth. Treatment and care for conjoined twins involve patient-centred care, a multidisciplinary team consisting of neonatologists, intensivists, surgeons, cardiologists, radiologists, pulmonologists, gastroenterologists, and a nurse is an indispensable member of this team. Likewise, caring for conjoined twins requires continuity of care, consistent communication, and the development of trust and comfort between staff and family.

Prenatal diagnostics

The girls V. and K. T. were born from the third, spontaneously conceived and regularly controlled pregnancy in which a twin pregnancy was monitored from the 11 weeks gestation when it was suspected that they were twins joined in the abdominal area. At 21 weeks gestation, a fetal MRI was performed, when two fetuses were confirmed to be joined ventrally by a common liver (fused in the abdominal area with the largest craniocaudal diameter of 4 cm - omphalopagus type). The thorax and pelvis of the fetus were distinctly separated. Every fetus had properly developed upper and lower limbs. Separate stomachs were observed, but this method cannot confirm or exclude the existence of a common biliary system (gallbladders were not observed with certainty) or other parts of the alimentary canal. Dilation of the intrahepatic bile ducts was not observed. The diaphragm was not visible as an anatomical structure, but its development was certain given the clear separation of the

anatomical structures of the abdomen from those of the thorax, without signs of diaphragmatic hernias. Nevertheless, a common diaphragm in the ventral part of both fetuses could not be ruled out. A separate urinary bladder was visible in both fetuses, as well as separate hearts with a regular display of collapsed lung parenchyma. As far as was available for analysis, there was one placenta, and one umbilical cord that was traced to the caudal part of the ventral junction. With this presentation, it was not possible to analyze the details of the blood flow of the fetuses, that is, to confirm or exclude the involvement of large blood vessels, especially veins, in the area of the omphalopagus. The presentation of cord parenchyma of both fetuses was regular.

Fetal echocardiography in the 29 and 33 weeks gestation showed regular morphology of the hearts of both fetuses. On 10 January 2019 (GD 32+3 weeks), the mother was hospitalized at the Department of Pregnancy Pathology of the Sveti Duh Clinical Hospital due to planned preparations for the termination of pregnancy, and on 16 January 2019 at 9:41 a.m., 2 female premature babies were born by Cesarean section, fused in the area of the lower part of the thorax and abdomen, with a combined birth weight of 3800 grams. The first twin was 43 cm long, with a head circumference of 29 cm, Apgar 7/8, cyanotic, not breathing on her own, with a heart rate <100/min, intubated, ventilated manually with a self-expanding balloon, and a peripheral venous line was installed. The second twin was 41 cm long, with a head circumference of 30 cm, Apgar 6/7/8, cyanotic, not breathing independently, with a heart rate <100/min, intubated and ventilated manually with a self-expanding balloon, and a peripheral venous line was placed and adrenaline administered due to bradycardia. For further treatment and care, the conjoined twins were transported in a transport incubator to the Clinical Hospital Center Zagreb, Department of Neonatology and Neonatal Intensive Care Medicine.

Admission of conjoined twins

Upon arrival at the department, the first twin, V.T., was orally intubated, manually ventilated, eupnoeic, did not use auxiliary respiratory musculature, had little spontaneous motor activity, blood oxygen saturation (SpO₂) was 90%, heart rate 140/min, blood pressure 45/24 (33) mmHg, and body temperature measured cutaneously was 35.1°C. The second twin, K.T., was orally intubated, manually ventilated, cy-



Figure 4. Conjoined twins after admission to the Department

Source: author

anotic, tachydyspnoic, retracting the intercostal spaces, spontaneous motility was absent, SpO₂ 79%, heart rate was 124/min, blood pressure 67/54 (61) mmHg, and body temperature measured cutaneously was 35.2°C. The twins were joined to each other ventrally, in the anterior medial line from the xiphoid to the outlet of the umbilical cord. On palpation, it appeared that the twins were fused in the area of the xiphoid/lower part of the sternum. The twins were cared for by a single nurse whose assessment provided valuable insight to the medical team in identifying clinical patterns, recognizing subtle changes and gaining a more meaningful understanding of the observed behaviour. When caring for conjoined twins, it is important that nurses caring for them understand their anatomy and expected physiology immediately after birth and are prepared for emergencies. Having a child hospitalized with complex medical problems causes significant stress on the family. The consistency of nurses in their approach and interventions provides an opportunity to observe family dynamics. This helps the care team optimize communication, manage parent education and understand coping mechanisms. The nurse is often a strong, supportive advocate for patients and families and can identify and seek out helpful resources (7).

Preoperative care

The twin girls were placed in an incubator and connected to mechanical ventilation. The most commonly used vascular approaches in neonatal care are the peripherally inserted central catheter (PICC) and the umbilical catheter (22). Due to the obvious impossibility of placing an umbilical catheter, girls V. and K. were inserted with PICC catheters.

Trophic feeding was started on the fourth day using breastmilk, with a gradual increase in the volume of the meals, which both twins tolerated adequately. On the twelfth day after being born, due to the necrotizing enterocolitis in the first twin, the enteral intake of both twins was stopped and antimicrobial therapy was started, which was quickly followed by a good clinical response and normalization of inflammation parameters. Due to the intertwin transfusion syndrome (cross-mixing of circulation between twins via a portosystemic shunt in the common liver parenchyma, proven by MSCT angiography), progressive arterial hypertension and polyuria (diuresis 308 ml/day) were observed in the one twin, and oliguria (diuresis 42 ml/day) in the other twin.

Serum electrolytes, creatinine and urea, due to abundant mixing of blood, were repeatedly uniform and within reference values in both twins. However, creatinine clearance in twin K. on the 30th day of life was 54 ml/min/1.73 m², and in twin V. 32 ml/min/1.73 m². The twins were connected to a monitor and the heart rate, blood pressure, number of respirations and blood oxygen saturation of each twin were recorded in the nursing documentation, and the laboratory findings from the venous blood sample were regularly checked. Ultrasound of the abdomen and colour doppler of the splenoportal basin were performed, showing 4 kidneys without signs of hydronephrosis, 2 separate urinary bladders, 2 spleens, 1 liver with normal echogenicity without dilatation of the bile ducts, 2 portal veins and normal hepatic arteries and veins. The gallbladder was shown only in the second twin. As already mentioned, the girls were on mechanical ventilation, each on their ventilation parameters, and the nurse monitored the respiratory status every day and periodically, if necessary, performed aspiration of the endotracheal tube. Endotracheal tube aspiration is a routine and common procedure in the intensive care unit to remove secretions and maintain airway patency so that oxygenation and ventilation in an intubated child can



Figure 5. **View of conjoined twins after mechanical ventilation**

Source: Author

be optimized. However, tube aspiration can cause hypoxia due to aspiration of oxygen from the lungs and alveolar collapse (24). Therefore, it is important to carry out the aspiration procedure in an adequate way. It is important to choose the appropriate size of the aspiration catheter, which should be one-third the size of the diameter of the inner lumen of the tube. Aspiration is performed by two nurses; one who performs aseptic aspiration and one that assists. The aspiration nurse advances the aspiration catheter to a predetermined length, ensuring that the catheter is only passed through the length of the tube. Applying negative pressure, the nurse gently rotates the catheter as they pull it out of the tube. The duration of negative pressure should not exceed 6 seconds to prevent hypoxemia. In order to prevent accidental extubation, the assisting nurse gently holds the child's head in a still position and perfuses the child between two aspiration procedures with a manual balloon.

When the procedure is complete, the nurse reconnects the ventilator tubing. After that, the nurse aspirates the child's nose and oral cavity to free them of secretions using a 6- or 8-gauge probe catheter for this procedure. It is important to observe the child's physiological parameters after aspiration. If closed suction is used for aspiration, the procedure is performed by one nurse because the aspiration catheter is protected in a foil that ensures sterility and there is no need to separate the child from the respirator. The method and duration of the procedure are the same as for open aspiration (25).

On the fifth day after birth, following the application of surfactant, the girls were taken off the ventilator, and respiratory support was continued with non-invasive mechanical ventilation (Figure 5).

Non-invasive mechanical ventilation has been in use for pediatric patients for many years. Historically, continuous positive airway pressure and bilevel positive airway pressure modes have been used for respiratory diseases, including neonatal apnea, bronchiolitis, asthma, and pneumonia. The newest type of non-invasive respiratory support is the application of a high flow of air and oxygen to a nasal cannula (high flow nasal cannula - HFNC), which has gained popularity in the last few years and its use is justified in the literature. Studies have shown that this method of respiratory support can reduce the need for intubation and ventilation, reduce the length of intensive care days and increase the comfort of the newborn. The skin, especially of young infants on long-term therapy, may be compromised under the interface due to pressure on the skin. Prevention of skin damage can be achieved by using a skin protectant (26). Maintaining the skin integrity of conjoined twins can be challenging due to limited positioning and mobility. During the care of the twins V. and K., a foam mattress was used to protect the skin from pressure injuries, and the twins were successfully placed on their mother's lap for bonding and social interaction. An important component of achieving the mothering role is bonding with infants through direct physical interaction, encouraging talk, touch, physical nurturing and holding as early and as often as possible.



Figure 6. **The plan for separating the twins**

Source: Author

With conjoined twins, enabling such interaction may be more feasible when they are younger and smaller in size, making the early days and weeks crucial for optimizing the mother's confidence. Foam packs helped reduce the redness of bony prominences. Gel pads have also been useful during hospitalization in reducing pressure on bone prominences. Repositioning and turning are imperative to prevent pressure injuries and maintain comfort. The twins' positions were changed every three hours. A key consideration in repositioning is maintaining twin identification. The twins needed to remain on their designated side of the bed to ensure proper identification. During hospitalization, the first twin V. T. urinated sparingly, had no bowel movement and developed necrotizing enterocolitis (NEC), which was treated conservative-

ly. The second twin K.T. urinated profusely (dialyzes the first twin), and a native CT showed a larger heart compared to the first twin, which was a consequence of hemodynamics, and she developed hypertension. On February 20, 2019, the medical advisory board held a meeting with the parents with the aim of making a decision on separation, but the decision was not reached (Figure 6). Six days later, at the re-meeting of the council, an agreement was reached on the surgical procedure due to the threatening decompensation of the second twin's heart, and the separation procedure was agreed upon for March 2, 2019.

The conjoined twins were transported to the operating room on March 2, 2019, at 7 in the morning (Figure 7).



Figure 7. **Separation surgery**

Source: Author



Figure 9. **The first twin after arriving at the Department after surgery**

Source: Author

The first twin kept a common part of the intestine from the duodenum to the omphalomesenteric duct, and because of NEC, a subtotal colectomy was performed and an ileostomy was formed. The intestinal continuity was established after 2, and the final closure of the abdominal wall after 4 months. The second twin kept a part of the remaining intestine (the duodenum before the joint part was connected to the ileum, and the abdominal wall was closed using Vacuum-Assisted Closure (VAC). The separated twins were transported back to the Department around 10 p.m.

Nursing care after surgery

After being admitted from the operating room, the girls were each placed in their incubator and cared for by two nurses. Continuous monitoring and methods of intensive treatment were carried out, which included the use of antimicrobial and antimycotic therapy, parenteral nutrition and nursing care. After separation, the other twin established adequate diuresis and gradual regression of arterial hypertension and hypertrophic cardiomyopathy occurred. During the course of stay after the operation, there was repeated appearance of fresh blood in the stool and abdominal distension, which normalized only after

the use of therapy and a semi-elemental milk formula (Alfare).

During the care of the first twin, the nurse paid special attention to the surgical wound and ileostomy due to the development of possible complications (Figure 9). The appearance of the ileostomy was assessed by observing the colour of the stoma and the surrounding skin. A red or dark pink stoma indicates adequate blood supply, while pale pink indicates reduced hemoglobin or poor perfusion, and grey to black indicates ischemia and potential necrosis, and urgent surgical examination is required. It is also necessary to assess the protrusion of the ileostomy, which is normally 0.5 - 1 cm above the skin. A retracted stoma indicates complications and is located below the level of the skin, as well as a prolapse, which indicates a protrusion of the stoma more than 2-3 cm above the skin (27). An infant with a formed ileostomy requires frequent and regular assessment of fluid and electrolyte status to prevent complications. Sodium is crucial for growth and infants with persistent sodium deficit are at risk of reduced growth and cognitive dysfunction. It is necessary to check serum electrolytes, urea and creatinine at least once a day until it stabilizes, then once a week until reanastomosis. More frequent monitoring depends on the child's weight gain, stoma losses, age, electrolyte stability and general condition. Sodium in the urine should be checked once a week. In infants with good renal tubular reabsorption, urinary sodium is the best measure of total body sodium and level of depletion. However, results can be misleading in premature infants and those with kidney disease. A low level of sodium in the urine (<20 mmol/L) is an indication to start taking nutritional supplements. However, most neonates with a stoma will need a supplement of 2-4 mmol/kg/day, which implies the addition of 3% sodium intravenously and modification of total parenteral nutrition (28). The introduction of enteral nutrition increases the production of content that flows out of the ileostomy and requires the protection of the skin with a stoma bag. For this purpose, bags with circular base plates are used, which can release the contents at the bottom. However, if greater convexity is required due to the indentation of the scars, the protective base plate can be cut to the desired size. The bags are not changed for at least 24 to 72 hours to preserve the integrity of the skin (29). Bags pointing downwards can become soiled with urine and can negatively affect the integrity of the skin and the

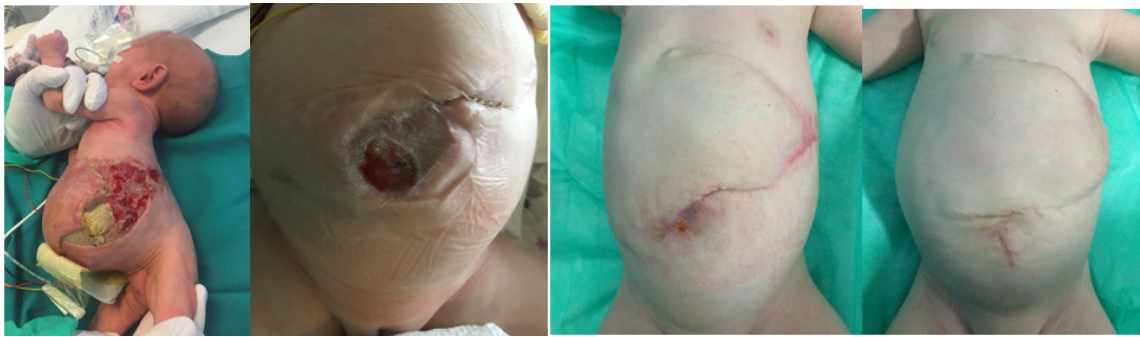


Figure 10. **Healing of the surgical wound - twin V.T.**

Source: Author

adhesion of the plate. If the base plate and the bag are well attached and there are no signs of leakage, the bag can be opened from the bottom and the contents can be removed using a syringe and the bag can be rinsed to remove the unpleasant smell. During the change of the base plate and the stoma bag, the nurse will wipe the skin around the entrance of the stoma with sterile water and slightly soft gauze, assess the appearance of the stoma, dry the skin with dry gauze, apply a protective spray and reattach the new base plate and bag (27). Due to the transitory immaturity of the intestines, most premature infants receive parenteral nutrition in the first few weeks of life. However, providing sufficient protein and energy to maintain optimal growth in such infants remains a challenge. Due to the immaturity of the gut during the first postnatal weeks, gastrointestinal feeding is insufficient to cover such needs at first. Despite the faster daily increase in rations, full enteral nutrition was achieved only around day 22 of life in a cohort of

preterm infants weighing less than 1000 g. Parenteral nutrition supplies preterm infants with nutrients, but it is far from approaching the complex composition of cord blood (e.g., in terms of lactate, growth factors) and should not necessarily mimic fetal nutrient supply, dramatic changes in metabolism that occur after birth. The use of parenteral nutrition can cause serious complications (e.g., sepsis, cholestasis, thrombosis) and often does not meet the needs of premature infants (30). Therefore, it is necessary to switch to enteral nutrition as soon as possible, which in the case of these twins was difficult due to separation surgery and incomplete intestines. During the administration of breast milk through a nasogastric tube, nurses continuously assessed the appearance and behaviour of both twins, measured the circumference of the abdomen, checked the gastric retention before each feeding and checked the appearance of the stool. The course of the first twin's stay was marked by recurrent ileus, peritonitis and difficult



Figure 11. **Transfer to the Neonatal Post-Intensive Care Unit**

Source: Author



Figure 12. Parents with the twins at the Neonatal Post-Intensive Care Unit

Source: Author



Figure 13. Discharge from hospital

Source: Author

healing of the surgical wound. After the first operation, she initially tolerated food properly and expelled stool on the ileostomy, however, four operations were performed to treat the ileus. Peritonitis was manifested by elevated levels of inflammatory parameters, a distended and painful abdomen and food intolerance. The surgical wound was difficult to heal, which required the nurse to implement interventions to prevent infection and improve healing. The nurse, with instructions from the surgeon, cleaned the surgical wound every day by using an aseptic method, washing the wound with a sterile saline solution, covering the surface with an Aquacell dressing to improve wound healing, and placing sterile dry dressings on the outer part, which she fixed with adhesive tape. It is important to note that in such cases it was also necessary to assess the surrounding skin, which was exposed to the daily change of adhesive tapes, which increased the risk of additional damage to the

integrity of the abdominal skin. The nurse assessed the appearance of the wound daily and recorded all changes in the nursing documentation in order to adequately monitor the progress of wound healing (Figure 10). Intestinal continuity was restored after 2 months, and the final closure of the abdominal wall after 4 months.

After 3 and a half months in the Neonatal Intensive Care Unit, the twins were transferred to the Neonatal Post-Intensive Care Unit, where enteral nutrition, parental education and health care continued (Figure 11).

Education and parental support

The birth of conjoined twins can lead to psychosocial stressors, religious dilemmas and relationships with the community. This can lead to serious disruptions in family dynamics, interactions between the medical

team and the family, and among the medical team itself. Nurses play an extremely important role in educating and supporting the parents since they spend 4 hours a day with them and through long-term hospitalization can assess all fears, doubts and needs of parents. The parents of the conjoined twins V. and K. T. have been involved in the care of their children from the beginning and, with the help of nurses, established an emotional and physical bond with them. They carried out the twins' hygiene every day, especially after the separation and monitored the feeding of the children. The mother expressed and stored breast milk regularly so that it could be given to the twins (Figure 12). The parents were educated about the possible food intolerance and the recognition of symptoms, about the independent implementation of personal hygiene, and they were also offered the support of a priest.

During hospitalization, parents actively participated in all the interventions related to the provision of nursing care. Due to their poor financial situation, help was organized for them with clothes and equipment for girls, as well as housing equipment. After a little more than seven months, on August 29, 2019, the girls were discharged with recommendations for further monitoring of growth and development (Figure 13).

Through coordinated care, the multidisciplinary team proactively identified the potential challenges of caring for conjoined twins. Nursing interventions made it possible to improve the condition and support the parents, who left the hospital extremely satisfied and still come to the Department every time the twins are scheduled for their follow-up appointment.

Conclusion

Conjoined twins, also known as "Siamese twins", are a unique type of monozygotic twins and constitute an extremely rare condition that is often incompatible with life. However, there are types of conjoined twins in which both twins cannot be separated and survive. Continuity of care for conjoined twins requires the collaboration of a large number of health professionals who must work together to plan inter-

ventions and respond to the unique challenges they face. Coordination of this care should be seamless and requires regular meetings of a multidisciplinary team that provides an effective approach to coordinate interventions and address all the unique challenges faced in the care of conjoined twins. Nurses caring for conjoined twins must demonstrate autonomy, ingenuity, and passion in promoting optimal outcomes for these rare and complex patients. The paper presents the case of conjoined twins, the girls V. and K. who were admitted to the Department of Neonatology and Intensive Care Medicine after being born in the Sveti Duh Hospital. After a multidisciplinary assessment and diagnosis, it was decided to carry out the separation procedure. The procedure lasted 15 hours and was without complications. Caring for conjoined twins requires the implementation of specific nursing care procedures that are an essential part of care and treatment. It is extremely important to know the characteristics and symptoms of this specific and extremely rare group of patients in order to be able to plan and implement specific interventions. Likewise, it is important to include parents in care as well.

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SPECIFIČNOSTI SESTRINSKE SKRBI U ZBRINJAVANJU SIJAMSKIH BLIZANACA

Sažetak

Sijamski blizanci jedna su od najrjeđih prirodnih anomalija s incidencijom u zapadnom svijetu od oko 1,47 na 100 000 poroda. Ovaj rijedak prirodni fenomen zastupljen je u svega 1 % monozigotnih blizanaca, tj. 0,05 % živorođenih blizanaca. Većina ih je mrtvorodena (40 do 60 %) ili umire rano u životu. Većina živorođenih ženskog je spola (75 %), zbog čega se smatra da ženski kariotip nosi korist u smislu preživljenja. Sijamski blizanci nastaju kada se zigota počinje razdvajati nakon 13. dana od oplodnje, u vremenu kada je već formiran tzv. embrionalni disk. Umjesto da nastanu dva odvojena embrija, ovo kasno razdvajanje uzrokuje nepotpuno odvajanje embrija. Naziv sijamski blizanci dolazi od sijamske braće Changa i Enga Bunkera, koji su rođeni u Sijamu. Kirurško razdvajanje sijamskih blizanaca najčešće je vrlo zahtjevan i složen postupak, a često nije ni moguće. Preživljenje nakon razdvajanja ovisi o vrsti i načinu spojenosti. U radu se prikazuju sijamske blizanke koje su rođene u 33. tjednu trudnoće. U 11. tjednu trudnoće postavljena je sumnja na ventralno spajanje blizanki (omphalopagus - spajanje u području abdomena). Dijagnoza je potvrđena fetalnom magnetskom rezonancijom u 21. tjednu trudnoće. U dobi od 45 dana života i pri zajedničkoj tjelesnoj masi od 4700 g indicirano je njihovo razdvajanje. Dugi tijek poslijeoperacijskog oporavka i liječenja trajao je tri mjeseca i komplicirao se infekcijama i problemima cijeljenja operativne rane druge blizanke. Liječenje i oporavak zahtijevali su multidisciplinarni pristup i dobro educirani tim liječnika i medicinskih sestara.

Ključne riječi: sijamski blizanci, prenatalna dijagnoza, kirurško razdvajanje, multidisciplinarni tim, medicinska sestra

Abbreviation Use Habits in Nurses' Work

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Abstract

Introduction. The use of abbreviations in nursing practice is common and frequent. Abbreviations are considered a time saver but can lead to omissions in work due to misinterpretation.

Aim. To collect data on the attitudes and habits of using abbreviations in nursing practice, and to determine whether there is a difference with regard to professional education, place of work and years of service.

Methods. A cross-sectional study was conducted during September 2020. A questionnaire implemented by Koh et al. in their research was used; permission was obtained to adapt the questionnaire according to our needs. The study was conducted at three Clinics at the UHC Zagreb. A total of 50 questionnaires were distributed on every clinic. The study was approved by the UHC Zagreb's Ethics commission.

Results. The use of abbreviations is common in nursing practice. Nurses most often learn abbreviations from nurses with longer work experience and regard the use of abbreviations as acceptable. Nurses with 16 or more years of service use abbreviations significantly more often in order to save time, than respondents with up to 15 years of service. Nurses with up to 15 years of service significantly more often report incorrect application of therapy as a result of misinterpretation of abbreviations compared to nurses with longer working experience.

Conclusion. The study showed that abbreviations are often used in nursing practice. Standard abbreviations are most often used, although non-standard abbreviations are also increasingly present. Abbreviations are acceptable in nursing practice, although nurses must be made aware that the use of abbreviations can lead to omissions in the work. For this reason, other researchers who have studied the use of abbreviations suggest that lists of permitted abbreviations should be created at the institutional level and that they should be regularly updated.

Introduction

An abbreviation is a shortened word or several words in written form; as a rule, it is written in lowercase letters and is not declined through cases (1). In the language of the medical profession, abbreviations are frequent, especially in written texts, and with the progress of science and technology, their use is becoming more frequent. Abbreviating terms means saving time while simultaneously achieving communication. A large influx of abbreviations, especially of foreign origin, can cause interference in communication due to the ambiguity of their meaning (2).

Medical terminology is the basic instrument for transmitting information between healthcare professionals and patients, but also between healthcare professionals. Every terminology, including those used in the medical profession, strives for standardization, which implies harmonization according to the principle of unequivocalness, systematicity and integration into the Croatian language system. Unequivocalness is an important characteristic of the language of science. Identical terms often have different meanings in different branches of science. Such non-uniformity in terminology leads to incomprehensible content, its misinterpretation and misunderstanding (3). Brunetti et al. in their study on the impact of the use of abbreviations on patient safety proved that the use of abbreviations bears risks for patient safety (4). Using the MEDMARX program, which collects and analyzes medication errors, he found that 30,000 of the 600,000 reported errors were attributed to errors caused by the use of abbreviations (4). Given that the program collects medication errors, the most common errors are related to the drug name, drug dosage, and the wrong route of drug administration (4). The Joint Commission created a 'Do not use list', i.e., a list of abbreviations that should not be used in medical documentation, so every institution in the USA that wants to be accredited must have this list implemented in its daily practice (5). The aim is to reduce the use of dangerous abbreviations that could jeopardize patient safety. In a study on the frequency of abbreviation use among physicians and nurses in Malaysia, the authors state that the main reason for using abbreviations is to avoid writing sentences entirely and thus save time. In the results of their study, they state that nurses are more prone to guessing

the meaning of an abbreviation. Both groups agreed that abbreviations are acceptable in everyday work (6). The Australian Health System has collected data on abbreviations used in health care settings and produced a detailed list of abbreviations that are allowed to be used (7). The initiative was started on the national level and is regulated by law. It is the responsibility of the healthcare staff to know which abbreviations are allowed, as well as the obligation to educate each newly hired healthcare worker. The list is updated once a year and is available to all healthcare workers (7). The Nursing and Midwifery Council also gives similar advice regarding the use of abbreviations in nursing practice (8). They believe that every healthcare institution should pay attention to how abbreviations are used and how many of them are used, to have a list of dangerous abbreviations and to conduct education. The focus is on expert professional societies that can create a nationally standardized list of permitted abbreviations (8).

Aim

To collect data on the habits of using abbreviations in nursing practice.

To determine whether there is a difference in the way nurses use abbreviations, depending on their level of education, place of work and years of service.

Methods

A cross-sectional study was conducted during September 2020. An anonymous questionnaire was used, consisting of four areas. The first area contained questions related to the level of education, place of work and years of service; the second area consisted of questions about the habits of using abbreviations (e.g. how often you use abbreviations in your work); the third area consisted of questions about the perception of abbreviations in nursing

practice (e.g. do you have problems interpreting abbreviations) through a series of statements to which respondents answered using a Likert scale where 1 meant 'I completely agree' and 5 meant 'I completely disagree'; the fourth area contained a list of abbreviations used in nursing practice in the departments where the research was conducted (e.g. EKG, BG, CT).

In the UHC Zagreb there is a document named DUI - List of abbreviations that may be used in nursing practice, which was used as the source for abbreviations in the fourth area. Koh et al. used a similar questionnaire (6), from whom permission was obtained to adapt the questionnaire according to our needs.

The study was conducted at three Clinics at the UHC Zagreb: the Clinic for respiratory diseases (KPB), the Clinic for heart and circulatory diseases (SKŽ) and the Clinic for neurology (NRL). At each clinic, 50 questionnaires were distributed, representing a total of 150 questionnaires; 136 questionnaires were filled out and returned to the researcher. The questionnaires were filled out by female nurses, with their average age being 35.3 (20 - 63 years of age). A convenience sample was used. Anonymity was ensured in such a way that each nurse received a questionnaire and

filled it out in a separate room and then put it in an envelope which she sealed. The study was approved by the UHC Zagreb's Ethics commission.

Descriptive analysis was used to display demographic data, as well as data related to the meaning of abbreviations. Differences in the perception of abbreviations with regard to the level of education, place of work and years of service were analyzed using the chi-square test, with a value of $p < 0.05$ being considered significant.

Results

The questionnaire was filled out by 136 respondents. The respondents were nurses from three clinics at the UHC Zagreb. At the clinic for respiratory diseases the questionnaire was filled out by 50 nurses, at the clinic for neurology by 44 nurses, and at the clinic for heart diseases by 42 nurses. The questionnaire was

Table 1. Respondents' demographic data

		n	%
Level of education	Nurse	56	41.2
	Bachelor of nursing	66	48.5
	Master of nursing / graduate nurse	14	10.3
Total		136	100
Place of work	Ward	87	64
	Intensive / post intensive care unit	30	22.1
	Other	19	14
Total		136	100
Years of service	Up to 5 years work experience	48	35.3
	5-15 years	27	19.9
	16-30 years	40	29.4
	More than 30 years	21	15.4
Total		136	100

Table 2. Frequency and reasons for the use of abbreviations, sources of information about abbreviations and problems due to misinterpretation

		n	%
Frequency of abbreviation use	all the time	11	8.1
	often	68	50
	occasionally	50	36.8
	rarely	7	5.1
Total		136	100
Sources of learning about abbreviations	professional literature	46	33.8
	coworkers	68	50
	physicians	10	7.4
	educational institutions	12	8.8
Total		136	100
Reason for abbreviation use	time saving	88	64.7
	space saving	13	9.6
	everyone uses abbreviations	23	16.9
	I don't feel like writing whole sentences	12	8.8
Total		136	100
Problems caused by incorrect interpretation of abbreviations	incorrect application of therapy	39	28.7
	incorrect time of therapy	15	11
	delayed therapy	29	21.3
	missed test	53	39
Total		136	100

filled out by female nurses. The largest number of respondents were Bachelors of Nursing, who mostly worked on wards, and mostly had less than five years of work experience. The data is shown in table 1.

Half of the respondents use abbreviations often, and an additional 36.8% use them occasionally, with time saving as the dominant reason for using them (64.7% of respondents). Coworkers are the source of information about abbreviations for half of the respondents (50%), 33.8% learn about them from professional literature. The most frequent problem caused by the misinterpretation of abbreviations are missed tests, as mentioned by 39% of respondents, followed by incorrect application of therapy (28.7% of respondents).

The highest level of agreement is with the statement 'I often encounter abbreviations in my work' (77.9% of respondents agree), followed by a high level of agreement that abbreviations are acceptable (72.1%), while 61.8% of respondents agree that they are necessary (61.8%). A fifth of respondents agree that they feel frustrated when interpreting abbreviations (21.3%) and that the interpretation of abbreviations interferes with their work (19.9%).

Nurses with 16 or more years of service use abbreviations significantly more often in order to save time, than respondents with up to 15 years of service.

Nurses with up to 15 years of service significantly more often report incorrect application of therapy as

Table 3. Degree of agreement with statements regarding the use of abbreviations

	Agree		Undecided		Disagree		Total	
	n	%	n	%	n	%	n	%
I often encounter abbreviations in my work	106	77.9	24	17.6	6	4.4	136	100
I have problems interpreting abbreviations	21	15.4	60	44.1	55	40.4	136	100
I must often guess what an abbreviation means	40	29.4	53	39	43	31.6	136	100
I feel frustrated when interpreting abbreviations	29	21.3	36	26.5	71	52.2	136	100
Interpretation of abbreviations interferes with my work	27	19.9	44	32.4	65	47.8	136	100
I feel abbreviations are necessary	84	61.8	42	30.9	10	7.4	136	100
I feel abbreviations are acceptable	98	72.1	31	22.8	7	5.1	136	100

a result of misinterpretation of abbreviations compared to nurses with longer working experience.

Nurses with up to 15 years of service significantly more often agree with the statement 'I often encounter abbreviations in my work', than nurses with 16 or more years of service.

The interpretation of abbreviations causes significantly more frustration in nurses with 16 or more years of service, than nurses with up to 15 years of service.

In the last part of the questionnaire, abbreviations that are most often used at all three UHC Zagreb clinics were shown. Abbreviations were divided into standard abbreviations and non-standard abbreviations. Standard abbreviations were such abbreviations that appear in short form in professional literature and are used in the majority of professional literature in the same way. Non-standard abbreviations were such abbreviations that are used on the three clinics, but that do not have the same abbreviated meaning in professional literature.

From the data presented in Table 6, it is evident that nurses more accurately recognized the meaning of standard abbreviations compared to non-standard abbreviations. The abbreviation EKG was correctly interpreted by 98% of nurses, while FT was correctly interpreted by only 13% of nurses.

The selection of abbreviations was made by the authors in such a way that when reviewing the nursing documentation, they noticed the most frequently used abbreviations and then made a list of abbreviations that are present in all clinics and a list of abbreviations that are present to a significant extent in certain clinics. For example, FOB as an abbreviation was frequent at the Clinic for Respiratory Diseases, which can be linked to the fact that 86% of the nurses of that clinic correctly interpreted it, while at the other two clinics, only 14% of the nurses correctly interpreted the meaning of this abbreviation.

Statistical significance related to table 5 was not analyzed due to the small number of individual responses that could affect the results.

Table 4. Frequency and reasons for the use of abbreviations, sources of information about abbreviations and problems due to misinterpretation with regard to years of service

		Years of service				Total		X ²
		Up to 15 years		16 years and longer		n	%	
		n	%	n	%			
Frequency of abbreviation use	all the time	6	8	5	8.2	11	8.1	0.536
	often	38	50.7	30	49.2	68	50	
	occasionally	29	38.7	21	34.4	50	36.8	
	rarely	2	2.7	5	8.2	7	5.1	
Total		75	100	61	100	136	100	
Sources of learning about abbreviations	professional literature	22	29.3	24	39.3	46	33.8	0.145
	coworkers	43	57.3	25	41	68	50	
	physicians	3	4	7	11.5	10	7.4	
	educational institution	7	9.3	5	8.2	12	8.8	
Total		75	100	61	100	136	100	
Reason for abbreviation use	time saving	41	54.7	47	77	88	64.7	0.046
	space saving	8	10.7	5	8.2	13	9.6	
	everyone uses abbreviations	17	22.7	6	9.8	23	16.9	
	I don't feel like writing whole sentences	9	12	3	4.9	12	8.8	
Total		75	100	61	100	136	100	
Problems caused by incorrect interpretation of abbreviations	incorrect application of therapy	29	38.7	10	16.4	39	28.7	0.007
	incorrect time of therapy	4	5.3	11	18	15	11	
	delayed therapy	17	22.7	12	19.7	29	21.3	
	missed test	25	33.3	28	45.9	53	39	
Total		75	100	61	100	136	100	

¹Pearson chi-squared test

Table 5. Degree of agreement with statements regarding the use of abbreviations with regard to years of service

		Years of service				Total		p ¹
		Up to 15 years		16 years and longer		n	%	
		n	%	n	%			
I often encounter abbreviations in my work	Agree	64	85.3	42	68.9	106	77.9	0.038
	Undecided	10	13.3	14	23	24	17.6	
	Disagree	1	1.3	5	8.2	6	4.4	
Total		75	100	61	100	136	100	
I have problems interpreting abbreviations	Agree	12	16	9	14.8	21	15.4	0.549
	Undecided	30	40	30	49.2	60	44.1	
	Disagree	33	44	22	36.1	55	40.4	
Total		75	100	61	100	136	100	
I must often guess what an abbreviation means	Agree	18	24	22	36.1	40	29.4	0.252
	Undecided	33	44	20	32.8	53	39	
	Disagree	24	32	19	31.1	43	31.6	
Total		75	100	61	100	136	100	
I feel frustrated when interpreting abbreviations	Agree	9	12	20	32.8	29	21.3	0.012
	Undecided	23	30.7	13	21.3	36	26.5	
	Disagree	43	57.3	28	45.9	71	52.2	
Total		75	100	61	100	136	100	
Interpretation of abbreviations interferes with my work	Agree	10	13.3	17	27.9	27	19.9	0.073
	Undecided	24	32	20	32.8	44	32.4	
	Disagree	41	54.7	24	39.3	65	47.8	
Total		75	100	61	100	136	100	
I feel abbreviations are necessary	Agree	49	65.3	35	57.4	84	61.8	0.496
	Undecided	22	29.3	20	32.8	42	30.9	
	Disagree	4	5.3	6	9.8	10	7.4	
Total		75	100	61	100	136	100	
I feel abbreviations are acceptable	Agree	57	76	41	67.2	98	72.1	0.284
	Undecided	16	21.3	15	24.6	31	22.8	
	Disagree	2	2.7	5	8.2	7	5.1	
Total		75	100	61	100	136	100	

¹Pearson chi-squared test

Table 6. Proportions of correct answers with regard to the meaning of abbreviations per clinic, and for all respondents

STANDARD ABBREVIATIONS				NRL (44)	SKŽ (42)	KPB (50)	ALL (136)
1.	ALL	EKG	Elektrokardiogram (eng. Electrocardiogram)	44 (100)	41 (98)	49 (98)	134 (98)
2.		GUK	Glukoza u krvi (eng. Blood glucose level)	43 (98)	38 (90)	48 (96)	129 (95)
3.		CVK	Centralni venski kateter (eng. Central venous catheter)	42 (95)	37 (88)	48 (96)	127 (93)
4.		CT	Kompjuterizirana tomografija (eng. Computed tomography)	39 (89)	37 (88)	41 (82)	117 (86)
5.	NRL	CVI	Cerebrovaskularni inzult (eng. Cerebrovascular insult)	41 (93)	37 (88)	42 (84)	120 (88)
6.		EEG	Elektroencefalogram (eng. Electroencephalogram)	39 (89)	34 (81)	43 (86)	116 (85)
7.	SKŽ	AIM	Akutni infarkt miokarda (eng. Acute myocardial infarction)	16 (36)	32 (76)	24 (48)	72 (53)
8.		PCI	Perkutana koronarna intervencija (eng. Percutaneous coronary intervention)	3 (7)	35 (83)	6 (12)	44 (32)
9.	KPB	KOPB	Kronična opstruktivna bolest pluća (eng. Chronic Obstructive Pulmonary Disease)	40 (90)	38 (90)	47 (94)	125 (92)
10.		FOB	Fiberbronhoskopija (eng. Fibrobronchoscopy)	1 (2)	5 (12)	43 (86)	49 (36)
NON-STANDARD ABBREVIATIONS				NRL	SKŽ	KPB	ALL
1.	ALL	UK	Urinarni kateter (eng. Urinary catheter)	6 (14)	8 (19)	15 (30)	29 (21)
2.		FT	Fizikalna terapija (eng. Physical therapy)	5 (11)	10 (24)	3 (6)	18 (13)
3.		HK	Hemokultura (eng. Hemoculture)	35 (26)	37 (88)	40 (80)	112 (82)
4.		KT	Kemoterapija (eng. Chemotherapy)	2 (5)	1 (2)	28 (56)	31 (23)
5.	NRL	LP	Lumbalna punkcija (eng. Lumbar puncture)	31 (70)	3 (7)	7 (14)	41 (30)
6.		EPI	Epileptički napad (eng. Epileptic seizure)	33 (75)	25 (60)	29 (58)	87 (64)
7.	SKŽ	P.M.	Pacemaker (eng. Pacemaker)	4 (9)	36 (86)	10 (20)	50 (37)
8.		ART	Arterija (eng. Artery)	27 (61)	32 (76)	33 (66)	92 (68)
9.	KPB	NK	Nazalni kateter (eng. Nasal catheter / cannula)	1 (2)	3 (7)	32 (64)	36 (26)
10.		VM	Venturi maska (eng. Venturi mask)	0 (0)	1 (2)	29 (58)	30 (22)

*Key: NRL (Clinic for neurology), SKŽ (Clinic for heart diseases), KPB (Clinic for respiratory diseases)

Discussion

Nursing documentation in hospital healthcare institutions in the Republic of Croatia is used in electronic form. By reviewing nursing documentation, it was observed that abbreviations are often used in nursing documentation. Respondents stated that they often use abbreviations in documentation, and 72% of them believe that abbreviations are acceptable in documentation. Although the use of abbreviations is considered common, respondents state that they have problems interpreting the abbreviations and that this can result in errors in nursing care (missed tests or incorrect application of therapy).

Koh obtained similar results (6). He included physicians and nurses in his research on abbreviations, and the results showed that abbreviations are used frequently and are acceptable in documentation. Also, their research shows that nurses have difficulties in interpreting abbreviations used by physicians, which can affect patient safety (6).

The Institute for Safe Medication Practices Canada monitors, records and analyzes reports of medication errors due to abbreviations, symbols, or acronyms. Thus, in their regular report (bulletin), they cite examples of errors such as a physician instructing a patient to take a medicine first 2/7, then 1/7, which meant that the patient should take one dose for two days, and then another dose for one day. The patient misunderstood the instructions and took one dose for two weeks, and then another dose for one week, causing side effects that required hospitalization (9). Such examples help the said Institute to revise the instructions for the use of abbreviations and issue a 'Do not use' sheet that is recommended for use in Canadian hospitals.

Research shows that interpreting abbreviations is a challenge for healthcare professionals. Thus, Sinha et al. conducted a survey of surgical wards using medical records to derive the abbreviations used in them. They used these abbreviations in a questionnaire that aimed to determine how many healthcare workers understood the meaning of the abbreviations. A total of 209 healthcare professionals filled out the questionnaire and only 43% of them correctly interpreted the abbreviations (10).

Tsima et al. also conducted a cross-sectional study aimed at determining the understanding of the meaning of abbreviations. They examined 57 patient records in which they found 1,683 abbreviations, symbols and/or acronyms. They used these abbreviations in the form of a questionnaire and had health professionals write the meaning. A total of 73% of healthcare professionals correctly interpreted the abbreviations. What is interesting in this research is that the respondents (58%) suggested alternative meanings of abbreviations (11).

Nakayama analyzed data in electronic patient records to track health outcomes of treatment and it was the presence of abbreviations that made the analysis of health outcomes difficult (12). The authors did not monitor health outcomes, but the data obtained could indicate that nurses' work experience has an influence on the interpretation of the meaning of abbreviations. This particularly applies to nurses who have been working for less than 5 years.

Tariq states that the use of abbreviations in medicine is becoming even more frequent. He mentions how the US Institute of Safe Medication Practices monitors adverse events, including adverse events associated with misinterpretation of abbreviations in medical records (13). Thus, the author states that increasingly hospitals are forming hospital commissions that monitor the use of abbreviations in medical documentation, and provide mandatory education of health workers about abbreviations, as well as regular updating of the list of abbreviations (13).

The quasi-experimental study conducted by Thachaparambil et al. showed how certain interventions can reduce the frequency of errors caused by the use of abbreviations. The authors conducted trainings for healthcare workers and created posters related to the use of abbreviations they put up in the wards. They compared the errors they observed before the aforementioned interventions and four months after the intervention and proved that the frequency of errors decreased by 8% (14).

According to the obtained data, standard abbreviations are more familiar to the respondents, but knowledge of abbreviations also depends on the workplace where they are used. So, Gomes states that non-standard abbreviations are used by 30% of respondents in his research (15). He recommends the use of software that would highlight abbreviations in medical documentation and thus enable regular

observation of new abbreviations, which also include non-standard abbreviations (15).

This study has certain limitations. A small number of respondents and only one institution were included. The study is cross-sectional, and we believe that some future longitudinal type of research could monitor abbreviations over time and show the change in the habits of using abbreviations as well as the speed of introduction of new abbreviations.

Conclusion

The study showed that abbreviations are often used in nursing practice. Standard abbreviations are most often used, although non-standard abbreviations are also increasingly present. Nurses most often learn about abbreviations from their coworkers and feel that abbreviations save time. Nurses with 16 or more years of service use abbreviations significantly more often to save time than respondents with up to 15 years of service. Nurses with up to 15 years of service report a significantly higher number of cases of incorrect application of therapy as a result of misinterpretation of abbreviations compared to nurses with a longer working experience. Abbreviations are acceptable in nursing practice, although nurses must be made aware that the use of abbreviations can lead to omissions in the work. For this reason, other researchers who have studied the use of abbreviations suggest that lists of permitted abbreviations should be created at the institutional level and that they should be regularly updated. Also, education of healthcare workers on how to use abbreviations should be mandatory.

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NAVIKE U UPOTREBI KRATICA U RADU MEDICINSKIH SESTARA

Sažetak

Uvod. Upotreba kratica u sestrinskoj praksi uobičajena je i učestala. Smatra se kako kratice štede vrijeme, ali mogu dovesti do propusta u radu zbog pogrešnog tumačenja.

Cilj. Cilj je ovog rada prikupiti podatke o stavovima i navikama upotrebe kratica u sestrinskoj praksi te utvrditi postoji li razlika s obzirom na stručnu spremu, mjesto rada i radni staž medicinskih sestara.

Metode. Provedeno je presječno istraživanje tijekom rujna 2020. Primijenjen je upitnik koji su upotrijebili Koh i suradnici u svojem istraživanju te je od autora dobiveno dopuštenje za prilagodbu upitnika našim potrebama. Istraživanje je provedeno na tri klinike KBC-a Zagreb. Na svakoj klinici podijeljeno je 50 upitnika. Istraživanje je odobrilo Etičko povjerenstvo KBC-a Zagreb.

Rezultati. Primjena kratica učestala je u sestrinskoj praksi. Medicinske sestre najčešće uče kratice od medicinskih sestara s dužim radnim stažem te smatraju primjenu kratica prihvatljivom. Nije pronađena statistička značajna razlika s obzirom na stručnu spremu i radno mjesto. Pronađena je statistički značajna razlika s obzirom na radni staž. Medicinske sestre s radnim stažem manjim od pet godina zbog pogrešne interpretacije kratica daju pogrešnu terapiju.

Zaključak. Istraživanje je pokazalo da je upotreba kratica učestalo prisutna u sestrinskoj praksi. Najčešće se upotrebljavaju standardne kratice, iako je sve učestalija prisutnost nestandardnih kratica.

Kratice su prihvatljive u sestrinskoj praksi, iako treba osvijestiti kako upotreba kratica može dovesti do propusta u radu. Zbog toga i drugi istraživači koji su istraživali upotrebu kratica predlažu da se na razinama ustanovama izrade popisi dopuštenih kratica te da se redovito ažuriraju.

Ključne riječi: kratice, sestrinska dokumentacija, medicinska terminologija, sigurnost pacijenta

Nursing Care in Hip and Knee Arthroplasty in Day Surgery

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Keywords: hip, knee, arthroplasty, day surgery, nurse, complications

Abstract

Background. Arthroplasty is a surgical procedure that has been shown extremely effective in reducing pain, improving joint function and overall quality of life. As a result, arthroplasty is steadily increasing as a procedure, especially in the hip and knee, thereby placing a financial burden on the healthcare system. It is believed that performing hip and knee replacements in day surgery should decrease public health costs.

Aim. The aim of the research is to determine the current knowledge and doubts arising from the literature published so far regarding the performance of hip and knee arthroplasty in day surgery, perioperative nursing care, as well as detecting possible potential perioperative complications.

Methods. The research of literature was conducted through the electronic databases, Medline via Pub Med (PMC), from March 3, 1992, till December 30, 2021. Key words used in the literature search are arthroplasty, replacement, hip, knee, adverse effects, ambulatory surgical procedures, nursing. Total of 22 papers was analyzed.

Results. A clinical algorithm is suggested to accelerate recovery as a possible solution to complications of arthroplasty in outpatient procedures. These algorithms reduce the cost of treatment and the risk of complications. In addition to the aforementioned benefits, perioperative outcomes and patient satisfaction are also improved, enabling recovery in the comfort of one's own home, which is especially important for the successful rehabilitation of elderly patients. Nurses should develop empathy for patients,

respecting their individuality and right to participate in treatment. Patients expect professionalism and trust from nurses and have specific expectations of nursing care.

Conclusion. Minimally invasive arthroplasty results in less trauma, less blood loss, less postoperative pain, painful surgical reactions, and improved hip mobility. The development of surgery and anesthesia in ambulatory surgery requires nurses to play a particularly important role in postoperative recovery.

Introduction

The number of patients undergoing total hip/knee replacement is increasing due to medicine development and increasing life expectancy. The rapid increase in patient numbers and the development of new surgical techniques, precision tools, and methods has put some pressure on surgeons and medical professionals with the goal of expediting early patient recovery and reducing operating time in the hospital (1).

Hip replacement is a surgical procedure in which the hip joint is replaced with an artificial prosthesis. It is an orthopedic surgical procedure in which the head and neck of the femur are surgically removed, and the acetabular cartilage and subchondral bone are removed. After resection, the hip prosthesis is implanted in an artificial canal located in the medullary region of the proximal femur. In 70% of cases, the primary reason for arthroplasty is osteoarthritis, as it causes severe pain and prevents daily activities. In addition to osteoarthritis, conditions leading to arthroplasty include hip dysplasia, Paget's disease, trauma, and osteonecrosis of the femoral head (2). Minimally invasive hip arthroplasty is defined as a procedure for installing a total or partial hip endoprosthesis, through a significantly smaller skin incision than the classic method and with minimal soft tissue trauma. Minimally invasive techniques require great skill and experience of the surgeon and complex, sophisticated instruments. Smaller instruments and prostheses allow a smaller surgical incision. Minimally invasive arthroplasty is responsible for reduced traumatization of tissues, reduced blood loss, less

postoperative pain, reduced surgical stress response, and is responsible for increased mobility of the hip joint (3,4).

Knee arthroplasty is a surgical procedure in which the knee joint is replaced with a prosthesis. The function of a healthy knee joint is to connect the lower leg bones with the upper leg bones. The surface where these bones meet becomes worn over time. Arthritis is often the cause of detrition, but there can be other reasons that cause joint pain and swelling. The most common reason for arthroplasty is the inability of other methods to eliminate permanent pain and other accompanying symptoms associated with arthritis. Arthroplasty aims to reduce the pain, increase the quality of life, and maintain or improve knee function. The procedure is performed in different age groups (5). Knee arthroplasty can be performed using partial and total endoprosthesis. Changes in the knee are the result of mechanical and biological factors. The knee joint consists of 3 parts that can be replaced by an endoprosthesis. These are medial, lateral, and patellofemoral.

The majority of patients that undergo an implantation of a knee endoprosthesis is indicated to have degenerative changes in two or more compartments, so for them the best choice is a total endoprosthesis. Only a small number has only one section affected, and it is more often the medial part of the knee that is damaged, therefore a partial endoprosthesis can be used. Total knee arthroplasty replaces all three sections of the knee joint, medial, lateral, and patellofemoral (5). Minimally invasive knee arthroplasty is a surgical method that is quite similar to the traditional method. The difference is that with minimally invasive surgery, there is significantly less destruction of the tissue surrounding the knee. The artificial implants used in the minimally invasive method are the same as those used in the traditional method. However, the instruments used in the minimally invasive method are specially designed and, therefore enable the preparation of the femur and tibia for the acceptance of implants with sparing traumatization of the bones and tissues (6).

Thanks to the accelerated recovery algorithm, postoperative recovery is accelerated, and morbidity, treatment and hospital days are reduced. The development of the algorithm is based on the analysis of the various components responsible for the accelerated recovery. These components include optimizing comorbidities and educating the patient and every-

one involved in the course of treatment and care, anesthesia and analgesia techniques, surgical techniques, postoperative pain management, and immediate and post-rehabilitation techniques during the recovery phase (7). Premedication was administered following a preoperative patient interview, document review, and physical examination. Premedication includes medications given before anesthesia, most commonly sedatives for sedation, pain relievers, antibiotics for prophylactic purposes, antiemetics, some medications that the patient takes on a regular basis, and others necessary to safely administer the anesthesia.

With the development of medicine, society has become more and more aware of the status of nurses and their role in the surgical care of patients. After being discharged the same day (in Europe) or 24 hours later (in the US), patients continued treatment in their own home. The treatment performed is under the supervision and responsibility of a nurse (8). The job of a nurse requires an increased level of skill and knowledge due to possible complications associated with total joint replacement surgery and anesthesia. The most common postoperative complications of total joint arthroplasty are deep vein thrombosis, pulmonary embolism, postoperative wound infection, bleeding, pain, endoprosthesis dislocation, and respiratory complications. During the home visit, the caregiver must identify all possible complications and make the right decision about continuing treatment.

The aim of this study was to determine the current state of knowledge and concerns emerging from the literature published to date on the perioperative care of patients undergoing total and partial hip and knee replacements in day surgery, and to show nurse's role in patient care during and after knee arthroplasty.

Methods

Reviews and clinical studies, i.e., complete articles, were used to prepare this article. Inclusion criteria were papers enrolling patients with hip trauma or chronic degenerative disease of the hip or knee, or patients with indications for hip or knee replacement. Exclusive criteria were work performed on the

pediatric population. Selected articles are written in English. The literature search covers the period from March 3, 1992, to December 30, 2021. The Medline database was searched through the PubMed interface. The following was used for the search: "Arthroplasty, Replacement, Hip/adverse effects"[Mesh] OR "Arthroplasty, Replacement, Hip/nursing"[Mesh]) OR ("Arthroplasty, Replacement, Knee/adverse effects"[Mesh] OR "Arthroplasty, Replacement, Knee/nursing"[Mesh])) AND ("Ambulatory Surgical Procedures"[Mesh]). A total of 51 items were found. After reading the abstracts of the selected papers in detail, 22 papers were selected for further analysis.

Results

Selection of patients eligible for one-day partial or total knee and hip arthroplasty is the most important factor with a critical impact on potential perioperative complications (9). Serious complications often occur within 24 hours of surgery, so identifying high-risk candidates is especially important to maintain patient safety and reduce the likelihood of readmission to a medical facility (10). In day surgery, it is extremely important to consider the complex interdependence of certain factors influencing patient selection for hip and knee arthroplasty. There are many factors to consider that are critical to the success of the surgical procedure. These factors are related to anesthesia technique, patient characteristics, and various social factors. The presence of concomitant diseases is also extremely important in selecting suitable candidates. Comorbidity has a major impact on perioperative complications, which translates into longer hospital stays and more frequent readmissions. Concomitant diseases that increase the risk of rehospitalization are mainly cardiovascular disease, especially heart valve stenosis and heart failure. In addition to cardiovascular disease, respiratory disease and cirrhosis are also important. One criterion that is certainly crucial in-patient selection is ASA physical status (ASA, English American Society of Anaesthesiologists) (table 1).

ASA Physical Status is used to classify the severity of concomitant diseases, i.e., to assess the patient's

Table 1. ASA classification of physical condition

ASA PS 1	A healthy patient
ASA 2	A patient with mild systemic disease
ASA 3	A patient with severe systemic disease
ASA 4	A patient with systemic disease that permanently endangers their life
ASA 5	A moribund patient who will not survive without the surgery
ASA 6	Proven brain death

health status. The CCI (Charlson Comorbidity Index) was also used, which is a valid method for assessing general health status and assessing possible readmission. The most common reason for rehospitalization is infection, although new studies have shown that this type of DM has limited impact on postop-

erative morbidity and mortality (11). Studies aimed at determining the effect of age on the success of accelerated recovery algorithms have shown mixed results. Results of a study in Denmark on accelerated recovery algorithms and age showed that age 80 and above limits the success of accelerated recovery algorithms. The length of hospital stay increases due to older age, as does the number of readmissions due to perioperative complications (12). However, a recent study in the United Kingdom showed that people over the age of 85 benefited the most from an accelerated recovery algorithm. Hospitals using the accelerated recovery algorithm significantly reduced the number of readmissions compared to the average number of readmissions without the accelerated recovery algorithm, and the length of stay was reduced from 5 days to 4 days, with the greatest benefit observed in people over the age of 85 (13). It is because of these results that further research on the age of the patients and total joint arthroplasty is warranted.

Table 2. Paper results used in analysis

Year	Authors	Conclusions
2015	Courtney PM, Rozell JC, Melnic CM, Lee GC. Who should not undergo short stay hip and knee arthroplasty? Risk factors associated with major medical complications following primary total joint arthroplasty. (10)	Most major medical complications requiring additional physician interventions occur greater than 24 hours following primary THA/TKA. Patients with history of COPD, CHF, CAD, and cirrhosis should not undergo short stay or outpatient TJA.
2013	Jorgensen CC, Kehlet H. Role of patient characteristics for fast-track hip and knee arthroplasty. (12)	Fast-track THA and TKA with LOS of ≤ 4 days and discharge to home is feasible and safe, including in elderly patients with comorbidities.
2013	Clement RC, Derman PB, Graham DS, Speck RM, Flynn DN, Levin LS, Fleisher LA. Risk factors, causes, and the economic implications of unplanned readmissions following total hip arthroplasty. (14)	The 30-day readmission rate was 6.51%. Increased age, length of stay, and body mass index were associated with significantly higher readmission rates. The most common re-admitting diagnoses were deep infection, pain, and hematoma.
2016	Khan A, Girish P. Anesthesia for Ambulatory Major Total Joint Arthroplasty: The Future is Now! (11)	For these procedures to be performed safely on an outpatient basis, it is necessary to implement multidisciplinary, multimodal protocols that improve functional outcomes, enhance recovery, and reduce the need for hospitalization. These protocols include appropriate patient selection, preoperative optimization of comorbid conditions, and patient education. Postoperatively, the focus is on early mobilization and accelerated physical therapy.
2014	Starks I, Wainwright TW, Lewis J, Lloyd J, Middleton RG. Older patients have the most to gain from orthopaedic enhanced recovery programmes. (13)	In all patient's median length of stay was reduced when compared with both our own data before the introduction of the pathway (6 to 4 days) and national averages over the same time period for both hip and knee replacements (5 to 4 days).

Year	Authors	Conclusions
2008	Bolognesi MP, Marchant MH Jr, Viens NA, Cook C, Pietrobon R, Vail TP. The impact of diabetes on perioperative patient outcomes after total hip and total knee arthroplasty in the United States. (15)	This analysis of a large patient database indicates clinically relevant information for patients and surgeons, suggesting that patients undergoing THA and TKA demonstrate more complications and utilize more resources if they have the comorbidity of DM level II evidence.
2011	Ghomrawi HM, Franco Ferrando N, Mandl LA, Do H, Noor N, Gonzalez Della Valle A. How often are patient and surgeon recovery expectations for total joint arthroplasty aligned? (9)	THA patients with either lower or higher expectations than their surgeon had lower physical and mental health status scores. TKA patients with lower expectations compared to their surgeon had a higher expectation of complications.
2010	Yoon RS, Nellans KW, Geller JA, Kim AD, Jacobs MR, Macaulay W. Patient education before hip or knee arthroplasty lowers length of stay. (16)	Education participants enjoyed a significantly shorter LOS than nonparticipants for both total hip arthroplasty (3.1 +/- 0.8 days vs 3.9 +/- 1.4 days; $p=.0001$) and total knee arthroplasty (3.1 +/- 0.9 days vs 4.1 +/- 1.9 days; $p=.001$).
2013	Ibrahim MS, Khan MA, Nizam I, Haddad FS. Peri-operative interventions producing better functional outcomes and enhanced recovery following total hip and knee arthroplasty: an evidencebased review. (17)	Enhanced recovery, good functional outcomes, and short hospital stays following THA and TKA can be achieved through clinical pathways and protocols with multimodal interventions.
2009	Dowsey MM, Choong PF. Obese diabetic patients are at substantial risk for deep infection after primary TKA. (18)	There were no prosthetic infections in patients with diabetes who were not obese. This compares with 11 prosthetic infections in patients who were obese and diabetic and four prosthetic infections in patients who were obese but not diabetic. Morbid obesity and obesity combined with diabetes are risk factors for periprosthetic infection after TKA.
2004	Jibodh SR, Gurkan I, Wenz JF. In-hospital outcome and resource use in hip arthroplasty: influence of body mass. (19)	Compared with others, morbidly obese patients (BMI > or = 40 kg/m ²) had significantly longer mean operative time and higher mean intraoperative blood loss ($p<.05$), a trend toward more complications, but no significant difference in functional recovery and hospital use.
2015	Maurice-Szamburski A, Auquier P, Viarre-Oreal V, Cu villon Ph, Carles M, Ripart J, Honore S, Triglia T, Loundou A, Leone M, Bruder N. Effect of sedative premedication on patient experience after general anesthesia: a randomized clinical trial. (20)	The findings suggest a lack of benefit with routine use of lorazepam as sedative premedication in patients undergoing general anesthesia.
2000	Rodgers A, Walker N, Schug S, McKeeA, Kehlet H, van Zundert A, Sage D, Futter M, Saville G, Clark T, MacMahon S. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. (21)	Neuraxial blockade reduces postoperative mortality and other serious complications. The size of some of these benefits remains uncertain, and further research is required to determine whether these effects are due solely to benefits of neuraxial blockade or partly to avoidance of general anaesthesia.
2010	Chang CC, Lin HC, Lin HW, Lin HC. Anesthetic management and surgical site infections in total hip or knee replacement: a population-based study. (22)	Total hip or knee replacement under general anesthesia is associated with higher risk of SSI compared with epidural or spinal anesthesia.
2007	Maurer SG, Chen AL, Hiebert R, Pereira GC, Di Cesare PE. Comparison of outcomes of using spinal versus general anesthesia. (23)	Compared with general anesthesia (GA), spinal anesthesia (SA) resulted in mean reductions of 12% in operative time, 25% in estimated intraoperative blood loss, 38% in rate of operative blood loss, and 50% in intraoperative transfusion requirements.

Year	Authors	Conclusions
2013	Harsten A, Kehlet H, Toksvig-Larsen S. Recovery after total intravenous general anaesthesia or spinal anaesthesia for total knee arthroplasty: a randomized trial. (24)	GA resulted in shorter LOS (46 vs 52 h, $p < 0.001$), and less nausea and vomiting (4 vs 15, $p < 0.05$) and dizziness (VAS 0 mm vs 20 mm, $p < 0.05$) compared with SA. During the first 2 postoperative hours, GA patients had higher pain scores ($p < 0.001$), but after 6 h the SA group had significantly higher pain scores ($p < 0.001$). Subjects in the GA group used fewer patient-controlled analgesia doses and less morphine ($p < 0.01$) and were able to walk earlier compared with the SA group ($p < 0.001$).
2011	Wylde V, Hewlett S, Learmonth ID. Persistent pain after joint replacement: prevalence, sensory qualities, and postoperative determinants. (25)	The association between the number of pain problems elsewhere and the severity of persistent postsurgical pain suggests that patients with persistent postsurgical pain may have an underlying vulnerability to pain. A small percentage of patients have severe persistent pain after joint replacement, and this is associated with depression and the number of pain problems elsewhere.
2008	Kerr DR, Kohan L. Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery: a case study of 325 patients. (26)	Most patients were able to walk with assistance between 5 and 6 h after surgery and independent mobility was achieved 13-22 h after surgery. Local infiltration analgesia is simple, practical, safe, and effective for pain management after knee and hip surgery.
2013	Perlas A, Kirkham KR, Billing R, Tse C, Brull R., Gandhi R., Chan VW. The impact of analgesic modality on early ambulation following total knee arthroplasty. (27)	Local infiltration analgesia was associated with improved early analgesia and ambulation. The addition of adductor canal nerve block was associated with further improvements in early ambulation and a higher incidence of home discharge.
2007	Montazeri K, Kashefi P, Honarmand A. Pre-emptive gabapentin significantly reduces postoperative pain and morphine demand following lower extremity orthopaedic surgery. (28)	Pre-emptive use of gabapentin 300 mg orally significantly decreases postoperative pain and rescue analgesic requirements in patients who undergo lower extremity orthopaedic surgery.
2005	Mizner RL, Petterson SC, Stevens JE, Vandenborne K, Snyder Mackler L. Early quadriceps strength loss after total knee arthroplasty. (29)	Patients who are managed with total knee arthroplasty have profound impairment of quadriceps strength one month after surgery. This impairment is predominantly due to failure of voluntary muscle activation, and it is also influenced, to a lesser degree, by muscle atrophy. Knee pain with muscle contraction played a surprisingly small role in the reduction of muscle activation.
2007	Kurtz S, Ong K, Lau E. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. (30)	By 2030, the demand for primary total hip arthroplasties is estimated to grow by 174% to 572,000. The demand for primary total knee arthroplasties is projected to grow by 673% to 3.48 million procedures. The demand for hip revision procedures is projected to double by the year 2026, while these large projected increases in demand for total hip and knee arthroplasties provide a quantitative basis for future policy decisions related to the numbers of orthopaedic surgeons needed to perform these procedures and the deployment of appropriate resources to serve this need.

Discussion

The most important factor that affects the outcome of the operation is the evaluation and optimization of accompanying diseases before the hip or knee joint replacement procedure. Smoking, low, or high body mass index (BMI, Body mass index), malnutrition are among the significant risk factors associated with possible complications. In the US, more than 8% of patients preparing for knee and hip arthroplasty have diabetes. Complications caused by diabetes are a tendency to infections and a prolonged stay in the hospital. To avoid possible complications, it is important that patients regularly control their blood sugar levels (15). A factor that can be influenced before performing arthroplasty to reduce the possibility of infection and improve the outcome of treatment is smoking.

The importance of the nurse's role starts from the beginning of the patient's reception, where patient's education is one of the most important ways through which the course of treatment and improvement of patient's recovery and the outcome of the operation can be influenced. Research has shown that preoperative education greatly affects the reduction of anxiety before the procedure and postoperative complications. The introduction of education programs, which usually start 3 weeks before surgery, has reduced hospital stay for 24 hours (16). During the education, it is crucial not only to inform the patient, but also their family. By educating family and friends, we ensure optimal care after leaving the hospital. The most important goal of education is to make the patient an active participant in the entire treatment process, and in this task the role and responsibility of the nurse is very significant (11).

In order for patients to undergo surgery as soon as possible, they need to be consulted with specialists, in which case nurses and surgeons propose indications for surgical treatment, allowing patients to find the greatest comfort in them. This alone can reduce fear and anxiety, build trust, and improve communication and outcomes. The patient is told about their current condition, treatment, upcoming surgery, what will happen before and after surgery, when they will be able to walk independently again, what surgery will be used, and what posture they will assume. The more knowledge that is passed on to the patient, the

more relaxed and cooperative they will be. Information must be clear, detailed, useful and simple (12).

In the last few years in developed healthcare systems, surgical techniques have been improved. From standard arthroplasty techniques, new approaches have been developed. Nowadays, what defines minimally invasive arthroplasty is the shorter length of the surgical incision and less surgical trauma. However, although the aesthetic aspect is very important to patients, as a rule it should not be of great importance. Minimally invasive surgery is certainly not performed only for the aesthetics, but also for other factors that affect the perioperative course and the course of rehabilitation itself. Minimally invasive surgical techniques allow minor dissection of soft tissue, including muscles, ligaments and joint capsule. Thanks to minimally invasive techniques, tissue trauma and pain are reduced, blood loss as well as the need for drainage are less, and the patient's mobility is increased. The minimally invasive technique requires an extremely skilled and experienced orthopaedic surgeon and corresponding increasingly sophisticated instruments and prostheses. Modern approaches to knee arthroplasty involve an incision smaller than 14 cm, avoiding quadriceps disruption, subluxation rather than twisting and dislocation of the knee. In total hip arthroplasty, the use of minimally invasive techniques results in greater mobility, reduced blood loss, and shorter hospital stays (6).

The results of the research showed that mortality in people who were under regional anaesthesia was reduced by 1/3 in contrast to people who were under general anaesthesia. Furthermore, the use of regional anaesthesia reduced the incidence of deep vein thrombosis by 44%, pulmonary embolism by 55%, the need for transfusion was reduced by 50%, and the incidence of pneumonia was reduced by 39% (21). As far as infections are concerned, research shows that the probability of infection is twice as high in patients who were under general anaesthesia than in patients who were under regional anaesthesia (22). Although it has been proven that regional anaesthesia has several advantages compared to general anaesthesia, there are also several disadvantages. Spinal anaesthesia in outpatients should be avoided. The reason is that spinal anaesthesia has many undesirable effects such as urinary retention, respiratory depression, itching (22).

The nurse's role in the postoperative period is primarily to help patient recover from anaesthesia. Af-

ter recovering from anesthesia, the patient requires intensive care. In order to receive full and complete care, the patient is transferred to the recovery room after anesthesia. Today, these wards are equipped with high-tech equipment to monitor the patient's vital signs and provide comprehensive care and control of the patient's condition. This room contains all instruments and equipment needed for emergency operations. These include ventilators, intubation and resuscitation equipment, defibrillators, as well as various infusions and necessary medicines. To ensure the best possible care, the patient's bed must be accessed from at least 3 sides. It is important to monitor vital signs and check dressings and drains. Pay special attention to the patient's breathing to avoid hypoxemia.

If the patient met the necessary criteria for discharge from the recovery room, the decision was made whether the patient remained in the recovery room or was transferred to postoperative anesthesia based on the assessment of clinical status by experienced staff using a specific point scale. Criteria for transferring patients from the post-anesthesia monitoring room to the surgical department (8):

- a. good respiratory function
- b. stable vital signs including blood pressure and pulse
- c. suitable orientation in time and space, answers coherently to simple questions, without signs of delirium
- d. satisfactory hourly diuresis
- e. without nausea and vomiting
- f. good control of postoperative pain
- g. without major losses on surgical drains that require quick surgical intervention
- h. patient in normothermia

After the surgery is complete and the patient is transferred from the recovery room, follow-up care continues on the ward. With the transfer to the ward, patient care is entirely up to the nursing staff. During the postoperative period, nurses must check vital signs, including temperature, and assess level of consciousness at least every two hours. Monitoring of vital functions provides information about the

patient's cardiorespiratory system and indicates possible complications. In addition, it is extremely important to monitor possible neurovascular changes in the operated limb. This includes skin tone, temperature, pulse, and capillary refill at least hourly. A nurse must monitor bleeding and control the amount of blood passing through the drain. Nurses' interventions are aimed at maintaining IV fluids and closely monitoring fluid balance during the postoperative period. Nurses frequently assess patient comfort and monitor and participate in the continuation of pain medication. Pain after surgery is the number one worry for patients, therefore it is important to consider pain control measures and explain how to manage pain before surgery. It is important for patients to understand the impact of pain on early mobility and recovery. To prevent thromboembolism and muscle wasting, the nurse encourages patients to move and exercise as soon as possible and provide enough training for them to continue exercising at home (8).

Optimizing the factors that cause pain, nausea and vomiting, orthostatic intolerance, will result in earlier discharge, rare unplanned admissions and greater patient satisfaction (11). It is necessary to educate the patient on the importance of personal hygiene, in order to prevent possible infections and complications around the surgical site (8).

With the surgery completed, the primary goals of the entire surgical team and the patient are early mobilization and expedited physical therapy. Although deceptively simple, this goal is often undermined by factors that need to be optimized before a patient is discharged from the hospital and begins home physical therapy (11). The caregiver should explain how to improve joint mobility and how to use assistive devices when changing positions and walking. This is important because after surgery, the patient is already familiar with the postural changes and has no doubts about how to perform specific movements (8).

In order for a patient to be discharged, they must meet several conditions. The patient should be able to stand unaided from a supine position. In addition, they should be able to stand up from a chair and walk 30 m unaided, and they should be able to ascend and descend stairs (11).

Conclusion

Hip and knee arthroplasty in day surgery is gaining in importance as a safe and cost-effective procedure. Recent literature confirms the importance of developing multidisciplinary clinical algorithms to accelerate recovery and improve perioperative safety. As the creation of clinical algorithms involves the entire perioperative team, nurses play an important role in creating processes related to postoperative care. During this time, the primary role of the nursing staff is to educate the patient on how to live with the implant while minimizing potential complications and adverse events.

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ULOGA MEDICINSKE SESTRE U ARTROPLASTICI KUKA I KOLJENA U JEDNODNEVNOJ KIRURGIJI

Sažetak

Uvod. Artroplastika je kirurški zahvat zgloba s izrazitim učinkom na poboljšanje njegove funkcije, smanjenje bolova te poboljšanje kvalitete života bolesnika. Stoga je izvođenje artroplastike, posebice kuka i koljena, u stalnom porastu, što za posljedicu ima dodatno financijsko opterećenje zdravstvenog sustava. Smatra se da bi financijskom rasterećenju moglo doprinijeti izvođenje zahvata u jednodnevnoj kirurgiji.

Cilj. Cilj je istraživanja pregledom literature utvrditi recentne spoznaje o izvođenju zahvata artroplastike kuka i koljena u jednodnevnoj kirurgiji te perioperacijskoj sestrinskoj skrbi, s posebnim osvrtom na prepoznavanje potencijalnih perioperacijskih komplikacija.

Metode. Pregled literature učinjen je pretraživanjem bibliografske baze podataka Medline preko sučelja PubMed (PMC) te selekcijom članaka objavljenih na engleskom jeziku u razdoblju od 3. ožujka 1992. do 30. prosinca 2021. Strategija pretraživanja kombinirala je ključne riječi: artroplastika, kuk, koljeno, komplikacije, jednodnevna kirurgija, zdravstvena njega. Ukupno je analizirano 22 rada.

Rezultati. Kao moguće rješenje problema komplikacija operacijskih zahvata artroplastike u jednodnevnoj kirurgiji literatura navodi upotrebu kliničkih algoritama ubranog oporavka. Algoritmi smanjuju troškove liječenja i smanjuju rizik komplikacija. Uz navedene prednosti, dolazi i do poboljšanja perioperacijskih ishoda te zadovoljstva bolesnika, kojima je omogućen

oporavak u ugodnoj okolini vlastitog doma, što ima posebnu važnost za uspješnost oporavka starijih bolesnika. Medicinska sestra mora uspostaviti empatijski odnos, poštivati pacijentovu jedinstvenost i individualnost te njegova prava da sudjeluje u svojem liječenju. Pacijent od medicinske sestre očekuje povjerenje, podršku te najbolju sestrinsku skrb.

Zaključak. Minimalno invazivna artroplastika zaslužna je za smanjeno traumatiziranje tkiva, smanjen gubitak krvi, manju poslijeoperacijsku bol i ublažen kirurški stresni odgovor te je zaslužna za povećanu pokretljivost zgloba kuka. Razvoj kirurgije i anestezije u jednodnevnoj kirurgiji sve više zahtijeva znatan doprinos medicinske sestre u poslijeoperacijskom oporavku.

Ključne riječi: kuk, koljeno, artroplastika, jednodnevna kirurgija, medicinska sestra, komplikacije

Comparison of the Effectiveness of Different Types of Protective Masks in Reducing the Transmission of the SARS-CoV-2 Virus: A Review Paper

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Keywords: protective equipment, effectiveness of protective face masks, side effects of wearing masks, SARS-CoV-2, infection

Abstract

Introduction. Protective equipment has become globally used to protect against respiratory infections in healthcare workers and sick patients. With the emergence of the SARS-CoV-2 virus and the global pandemic, the role of protective masks in reducing the transmission of the new virus has become the subject of much research. Although the protective mask has a significant role in reducing the transmission of infections, wearing it also has certain adverse effects.

Aim. The aim of this review is to show the effectiveness of different types of protective masks in reducing the transmission of the SARS-CoV-2 virus, as well as the comparison of adverse effects when wearing protective masks.

Methods. The method for analyzing the topic of the effectiveness of protective masks included reviews of papers found on the Google search engine, Medline database (via PubMed) and Hrcak. Included in the analysis are scientific papers with clinical trials or review papers, in English and Croatian, regardless of methodology, published since 2020. Included works include topics such as medical masks, respirators, cloth masks and their materials, effectiveness and importance of use, and adverse effects of wearing protective masks. A total of 2,110 articles, original and review papers were found, of which, after a detailed reading and analysis of several authors, 11 were selected that meet the eligibility criteria of this review paper.

Results. There are filter half-masks with/without valve, surgical masks and hygienic or cloth masks. A surgical mask may provide better protection than a cloth mask, although this may depend on the layers and material the masks are made of. Respirator masks are somewhat more effective than surgical masks, but the difference turned out to be insignificant. The most common side effects of wearing masks for a long time are increased secretion of sputum, cough, dyspnea, difficulty when communicating, lack of closeness and feelings of insecurity.

Conclusion. A face mask protects against infection and is associated with a reduced risk of infection. The habit of wearing a mask and the correct way of wearing it proved to be important factors in reducing the risk of infection.

Introduction

Protective masks and respirators have become globally used for protection from respiratory infections in healthcare workers and sick patients. In December 2019, several health facilities in Wuhan, China, reported clusters of patients with pneumonia of unknown cause and similarly to patients with SARS and MERS, these patients showed symptoms of viral pneumonia, including fever, cough, chest discomfort and, in severe cases, dyspnea and bilateral lung infiltration (1,2). When SARS-CoV-2 virus started to appear and caused a global pandemic, it also became an important addition to our arsenal in the fight against the virus and a normal routine for healthy population to wear protective masks (3,4). Coronaviruses have globally affected populations since the early 21st century, but this new SARS-CoV-2 virus caused coronavirus disease (COVID-19) which appeared in Wuhan, China and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, after the identification of >118 000 cases in 114 countries. COVID-19 started to be a major health burden in many countries around the world and more specifically a burden for the healthcare system (5-7). The role of protective masks in decreasing transmission of SARS-CoV-2 virus started to be the subject of many researches given the global shortages of

personal protective equipment during the pandemic. One of the main reasons is that this particular respiratory pathogen is transmitted through direct/indirect contact, through the air with respiratory droplets containing the virus or dispersed aerosol (8-10). Hypothesis is that when a person with COVID-19 breathes heavily, sneezes or coughs, the virus could be excreted in the air. Coughing and sneezing in close contact can potentially cause mucosal or conjunctival infection by infective droplets. If droplets are <5 µm in diameter, they are dispersed hundreds of meters in the air and they can also stay there for a long time. SARS-CoV-2 virion is 0.1 µm in diameter, but it is carried in respiratory droplets that also contain salts, proteins and other components of respiratory fluid (11). To reduce the number of infected people, first advice was physical distancing, but face masks have shown to be potentially effective as they have been used for decades for prevention of viral and bacterial infections, therefore they became mandatory for people during the COVID-19 pandemic next to hand washing, distancing in poorly ventilated settings and eventually vaccination (12,13). Healthcare workers are significantly at risk for a range of infections and various infectious agents that can be transmitted from patients to healthcare workers and vice versa (5). As government officials and public health stakeholders implement measures to slow the spread of SARS-CoV-2, healthcare workers treating COVID-19 patients are among those at highest risk of infection. During the severe acute respiratory syndrome (SARS) pandemic in 2003, healthcare workers made up 21% of global cases. As of February 11, 2020, China's Infectious Disease Information System has reported COVID-19 in 1716 healthcare workers (6).

According to the recommendations of Croatian Institute of Public Health (*Hrvatski Zavod za javno zdravlje - HZJZ*), filter half-masks with/without valves, surgical masks, and hygienic or cloth masks are distinguished. In the community, regular cloth masks and surgical masks can be useful and protective, but in healthcare settings sometimes there is a need for use of respirators (8). The WHO recommended the usage of medical masks for healthcare workers on their workplace, symptomatic people, people infected with SARS-CoV-2 virus, people that were in close contact with COVID-19, elderly and people with preexisting medical condition (3,13,14). Filtering and protection ability from pathogens depends on the type of masks and the materials that are used to make the mask.

Besides that, position of the mask against the skin and face is also important when choosing a mask. It is necessary to consider the porosity of materials and the ability of filtering viruses and respiratory droplets that contain the virus. Size of respiratory droplets can vary but according to current knowledge, aerosol containing droplets smaller than 5 μm are the primary source of respiratory infections and can remain in the air for about 3 hours. Factors that affect efficacy of face masks against COVID-19 are the size of respiratory droplets, mode of the expulsion of respiratory droplets, materials, fit of face masks and lastly technique used in removing and reusing masks. Considering that SARS-CoV-2 is expelled from the respiratory tract while talking, sneezing or coughing, for a mask to be effective, it must be able to filter particles of various sizes. The combination of material, number of layers, the presence of filters and how tightly the material is woven will also affect the efficacy of the face mask (7). Masks are a key to stop or to slow down viral transmission and they can be used either as a protection, or as a prevention of future transmission and many different types of masks offer different levels of protection. They can be reusable or disposable. Reusable ones include industrial half face or full face respirators with filters attached and homemade or commercial cloth masks; disposable ones include surgical masks, N95 respirators, and KN95 respirators. They all serve the general purpose of providing some form of protection against contaminants in the air (15). Despite the positive side of protective masks, in another aspect they can represent some kind of a barrier and can have a negative impact on therapeutic interventions and patient-clinician relationships, as well as the well-being and resilience of both patients and staff. They can create a physical barrier to effective communication, create a psychological barrier to the development of therapeutic relationships, and disrupt non-verbal communication (16,17).

Methods

The method for analyzing the topic of the effectiveness of protective masks included reviews of papers found on the Google search engine, Medline database

(via PubMed) and Hrčak. Included in the analysis are scientific papers with clinical trials or review papers, in English and Croatian, regardless of methodology, published since 2020. Included works include topics such as medical masks, respirators, cloth masks and their materials, effectiveness and importance of use, and adverse effects of wearing protective masks. The total of 2,110 articles, original and review papers were found, of which, after a detailed reading and analysis of several authors, 11 were selected that meet the inclusion criteria for the needs of this review paper.

Analysis

The selected works were analyzed in four steps. In the first step, those articles whose titles corresponded to the selected keywords that were entered in the Medline (Via PubMed) database, Google search engine and Hrčak were analyzed. In the second step, those works that were published in the period from 2020 were analyzed. In the third step, summaries of papers corresponding to the title and year of publication were analyzed. In the fourth step, the articles are divided into groups, depending on the subject area they cover (types of protective masks, effectiveness of protection and side effects of long-term wearing of masks). Content analysis was done by several authors. The connection between the effectiveness of protective masks in the transmission of the virus and the type of protective mask was investigated.

Results

Medical/ Surgical masks

Coronaviruses are found in aerosol particles compared to large droplets and can be expelled by normal breathing and wearing a surgical mask can prevent the virus from being exhaled into the environment (3). They are made of 3 layers of non-woven textile. Non-woven polypropylene, 20 grams per square meter (gsm) made by a spun-bond process is commonly used for the outer and inner layers whereas 25 gsm made by melt-blown technology is used for the filter.

Polystyrene, polyethylene, polycarbonate, polyester can also be used (8,18). The inner layer is made of material that absorbs drops of saliva and respiratory secretions of the user, which also increases the comfort of wearing the mask. The middle layer forms a filter that prevents the passage of pathogens of certain sizes. The efficiency of the bacterial filtration of the surgical mask, the standard size of particles with a diameter of about 3.0 μm and larger, is 95% for type I and 98% for type II. The outer layer of the mask is water-repellent to ensure the repellency of body fluids and larger respiratory droplets. They are mostly made of polypropylene fibers, and the filter layer is made of finer microfibers (8,15).

FFR / FFP

FFR (respirators) and FFP (Filtering Face Piece) are particle filters that provide protection against particles of solid and liquid aerosols and bioaerosols. They work on the principle of negative pressure and filter the inhaled air; whereby particulate contamination is retained on the outer surface and inside the filter structure and are designed to closely fit without leaving spaces around borders. Exhaled air is also filtered in a mask without a valve, and in this way, they ensure self-protection and external protection, while masks with a valve for exhaled air that goes out unfiltered into the external atmosphere ensure only self-protection of the user. FFP masks are divided into three classes: FFP1, FFP2, FFP3. In the mentioned masks, the efficiency of filtering particles smaller than 300 nm, with an average size of filter pore diameter of ~ 300 nm (necessary for unhindered breathing of the user), is ensured by the multi-layered non-woven three-dimensional structure of the mask made of extremely fine micro- and nanofibers of small diameter and the application of electrostatically charged filter, whose action is based on the binding mechanism of electrostatically oppositely charged small particles (primarily viruses, including SARS-CoV-2). All of the above makes them applicable in the context of protection against the coronavirus, unlike the FFP1 class mask, which provides effective protection only against dust and sand. Filter protective masks of class FFP2 and FFP3 are made of a minimum of 4 layers. An example of an N95 mask shows an outer layer made of a hydrophobic polypropylene fiber material that prevents the passage of moisture, droplets and aerosols, followed by a filter layer and an intermediate layer that strengthens the

mask and increases its thickness. The inner layer is also made of a hydrophobic material, the task of which is to minimize the intake and passage of moisture inside the mask and thereby increase the filtering efficiency. FFR and FFP masks are regulated and are tested for fluid resistance, filtration efficiency (particulate filtration efficiency and bacterial filtration efficiency), flammability and biocompatibility (7,8,15).

Cloth masks (non-medical masks)

Cloth masks (also known as barrier masks, community face-coverings, non-medical face masks) cover the user's nose, mouth and chin and are made from one or more layers of commercially available textile materials (woven, knitted, non-woven, etc.) and like the others masks must have a part that attaches to the head or ears. They can be disposable or reusable. Cloth masks for single use are most often made from non-woven textiles, and cloth masks for multiple use from fabrics or knits (8). Non-medical masks are readily available from many local sources and therefore impossible to adequately regulate, which seems to be a problem in managing materials and protection assessment. Many versions provide an inadequate seal to the mouth and nose so there is poor fluid resistance and frequent readjustment. The efficacy of a cloth mask can depend on the material used. The most protective cloth face masks require at least three layers with a hydrophilic inner layer to consume moisture from the wearer's breathing and hydrophobic outer layers (7,18).

Efficiency and differences of masks, and their importance of wearing

Wanting to test efficiency and difference between medical mask and respirator, C. Raina MacIntyre et al. carried out research on preventing upper respiratory tract bacterial colonization and co-infections in hospital health care workers. Subjects were randomized to mask or respirators and had to wear it properly and correctly on every shift (8- 12 h) for four weeks. Participants were given three masks every day for the medical mask group or two N95 respirators. They had to store the mask in a paper bag once they removed it. They were also instructed to observe proper hand hygiene prior to/after removal of the mask. All participants were followed up for four weeks for development of respiratory symptoms and for an additional

week after mask wearing had ceased (to account for incubation of infections acquired in week 4). The rates of bacterial detection were lower for N95 respirators compared to medical masks (2.8% and 5.3% respectively). N95 respirators were significantly more protective than medical masks against the laboratory-confirmed presence of bacteria. N95 (but not medical masks) demonstrated efficacy against multiple bacterial pathogen colonization as well as co-infection with a virus and bacteria and against dual virus infection. They demonstrated 59% efficacy of N95 respirators against any co-infection and 67% against bacterial/viral co-infection (5). Furthermore, Jj Bartoszko et al. in their systematic review of preventing COVID-19 with medical masks or respirators found that when seasonal coronavirus was tested for by PCR in this non-cluster randomized trial of medical masks versus N95 respirators, 4.3% of nurses in the medical mask group had PCR confirmed coronavirus infection compared with 5.7% in the N95 respirator group. On the other side, no convincing evidence was found showing that medical masks are inferior to N95 respirators for protecting healthcare workers routine care and non-aerosol-generating procedures. Medical masks performed similarly to N95 respirators in preventing laboratory confirmed influenza infection. For influenza-like illnesses and clinical respiratory illnesses, the point estimates favored N95 respirators; the findings support preliminary epidemiological data from a case-report of respiratory protective devices for COVID-19. Forty-one healthcare workers were exposed to aerosol-generating procedures from a patient with severe pneumonia, who later tested positive for SARS-CoV-2 during COVID-19 surveillance. These procedures included endotracheal intubation, extubation, non-invasive ventilation and exposure to aerosols in an open circuit. All of the exposed healthcare workers tested negative 14 days after their date of exposure, despite 85% having worn surgical masks during the high-risk procedures and not respirators (6). According to another study, there was also a minimal difference in protection between N95 masks and surgical masks, with a hazard ratio of 0.84 and a 95% confidence duration of 0.36-1.99, indicating no significant difference in risk (19). In 2013, laboratory studies have demonstrated the ability of surgical masks to provide inward and outward protection against viruses. They tested eight different surgical masks against influenza virus in droplets/aerosols of size 1-200 μm and found that the amount of virus detected behind the mask was reduced by an average

83%. In another research, a variety of cloth materials removed 49% to 86% of aerosolized bacteriophage MS2, compared to 89% removal by a surgical mask. According to fit tests on 21 adults in the same study, homemade, 100% cotton masks provided inward filtration efficiencies of 50%, compared to 80% for surgical masks. Homemade masks made from tea cloths had an inward filtration efficiency of 60%, compared to 76% for a surgical mask. At the most penetrating particle size, the vacuum bag, microfiber cloth, and single-layer surgical type mask had material filtration efficiencies $>50\%$, while the other materials had much lower filtration efficiencies. However, these efficiencies increased rapidly with particle size, and many materials had efficiencies $>50\%$ at 2 μm and $>75\%$ at 5 μm . The vacuum bag performed best, with efficiencies of 54-96% for all three metrics, depending on particle size. The thin acrylic and face shield performed worst. Inward protection efficiency and outward protection efficiency were similar for many masks; the two efficiencies varied for stiffer materials and those worn more loosely (e.g., bandana) or more tightly (e.g., wrapped around the head) compared to an ear loop mask. It was indicated that the fit of the mask was important (11). Another study demonstrated that homemade masks made of tea cloth delivered safety during short and long-term activities. Ma et al. demonstrated that while N95 respirators blocked 99.98 % of avian influenza virus, cloth homemade masks and surgical masks were comparative 95.15 % and 97.14 %. These homemade masks were created from polyester and kitchen towels and were used in the experiment. A more comprehensive study was conducted by Davies et al., to test the efficacy of homemade masks against bacterial and viral aerosols with a size of 0.95-1.25 μm , and bacteriophage MS2 with a size of 0.023 μm . The masks were made from different common household materials, including 100% cotton T-shirt, scarf, tea towel, pillowcase, antimicrobial pillowcase, vacuum cleaner bag, cotton mix, linen and silk. All materials were able to block the microorganisms in some ways and they all worked better in the case with particles that were larger in size. Although the surgical mask as a control sample has the highest efficacy, the vacuum cleaner bag, tea towel, and cotton mix also showed filtration efficiency of higher than 70%. The ones with the lowest efficiency were the scarf, pillowcase, and silk, most of which however still had $>50\%$ efficacy (15).

Possible side effects after long use of masks

According to the study conducted by Dimitra S. Mouliou et al. that researched masking preference and respiratory side effects, amongst 4107 participants, 63.4% of the mainly female responders preferred medical/surgical masks, 20.5% responders who were mainly men preferred cotton cloth masks; and lastly 13.8% preferred FFP/(K)N95 masks. COVID-19 history was less common in FFP/(K)N95 compared to medical/surgical (9.2% vs. 15.6%, $p < 0.001$) or cloth masks (9.2% vs. 14.4%, $p = 0.006$). Compared to the control group (rare mask-wearing, non-smokers and without lung conditions), those wearing one medical mask were more likely to report frequent sputum production (4.4% vs. 1.9%, $p=0.026$) and frequent cough (4.4% vs. 1.6%, $p=0.013$), and those wearing FFP/(K)N95 masks were more likely to report frequent cough (4.1% vs. 1.6%, $p=0.048$). Compared to the control group, those preferring cotton cloth masks were more likely to report a frequent cough (7.3% vs. 1.6%, $p=0.0002$), sputum production (6.3% vs. 1.9%, $p=0.003$) and dyspnea (8% vs. 1.3%, $p=0.00001$) (13). Other research suggests that wearing masks acts as a physical barrier and affects the implementation of therapeutic procedures and the relationship between health professionals and patients (20). In addition to the physical, masks are also associated with psychological barriers, alienation and reduced communication (16,17).

Discussion

With the emergence of a new SARS-CoV-2 virus, wearing protective equipment, specifically protective masks, has played an important part in lowering the risk of an infection. Many COVID-19 transmissions arise from people who are pre-symptomatic or asymptomatic. Infected patients can transfer SARS-CoV-2 just a few days before manifesting clinical symptoms or during the incubation period. Wearing a mask when keeping a safe distance is not possible most likely reduces the spread of virus containing droplets and therefore the risk of transferring SARS-CoV-2 decreases. Wearing a protective mask in the

community and in medical settings has been recommended as a straightforward and low-cost strategy to decrease virus transmission by preventing the droplets from leaving the infected wearer and coming into the environment and also in preventing the droplets from entering the respiratory tract. Numerous governments and public health agencies around the world have advocated the wearing of masks in public settings (19,21,22). Mathematical modelling on the 2009 (H1N1) influenza concluded that if masks were enforced early at 100 versus 1000 infectious people, the number of outbreaks would be reduced significantly. Everyone, not only infectious individuals, should wear masks to significantly reduce the number of cases. In this model, the effectiveness of surgical masks was low and insignificant (15). For N95 respirators operating at 20% effectiveness, a significant reduction of influenza (20%) was achieved if only 10% of the population wore them. If 25% and 50% of the population complied, the reduction would be 30% and 36%. Similar conclusion was made for COVID-19 theoretical model. When a minimum of 80% of people wore masks, the impact on the pandemic was significant. However, this intervention failed when 50% or less of the population wore masks (15). It is recommended using protective masks for general population, especially for health care workers and people caring for COVID-19 patients. Respirators and surgical masks hold monopoly over cloth masks because of their materials and layers, but a cloth mask made of specific material with layers was shown to be useful too. The number of layers, the properties of the fibers including diameter and electrostatic charges, and the material composition all contribute to differences in filter quality factors (11). Medical/surgical masks are primarily used for medical purposes, in operating rooms and health-care institutions with similar requirements and serve to prevent the spread of droplets from the user's exhaled air to the patient or another person and in certain circumstances to protect the user from blood splashes and other potentially contaminated body fluids. Their use is one-time use, and they can to a certain extent protect the mouth and nose area of the user from the direct impact of larger droplets from another person, as well as from the transmission of pathogens by direct contact with the hands (8). Regarding respirators and filtering face piece, particle filtering efficiency size around 0.3 μm in the filter material of FFP2 masks is at least 94% and FFP3 masks at least 99%. Approximately the same

effectiveness of respiratory protection is provided by filter half-masks from the United States of America (compliant with NIOSH 42 CFR 84) marked N95, N99 or N100, and from China compliant with the requirements of the national standard GB 2626:2019 and marked with KN95, KN99 or KN100. The mark N indicates that they are non-oil resistant, whereby the efficiency of filtering particles with a size of about 0.3 μm in the filter half-masks marked N95 and KN95 at least 95%, the filter half-masks marked N99 and KN99 at least 99%, and filter half-masks marked N100 and KN100 at least 99.97% (8). Cloth masks are intended for users who do not have clinical symptoms of a viral or bacterial infection and do not come into contact with people who have such symptoms. They slow down and reduce the range of respiratory droplets of saliva and secretions from the user's nose, mouth and airways that occur when speaking, coughing and sneezing, and can limit the penetration of larger respiratory droplets containing the virus from external sources into the user's nose and mouth area, although they do not guarantee their protection (8, 20). They have filtration ability at 3-60%. Considering both filtration efficacy and pressure drop, the best material for a cloth mask, especially when homemade, was found to be 100% cotton t-shirt material or pillow case material. People can be instructed to use these cloth masks for protection if medical masks are unavailable in stocks because it can provide basic protection (19). Given the size of the SARS-CoV-2 virus, surgical masks cannot completely prevent the inhalation of such small particles and thus do not provide complete protection against biological agents of the disease (8,15). Looking at many studies on the differences between masks, one thing has proven to be certain, they are necessary in controlling infection, specifically useful for reducing the risk of contracting SARS-CoV-2. Emergence of the virus initiated the need for wearing masks and assessing their ability to protect against the spread of the infection. The virus, which primarily originated from animals, began to spread from person to person. SARS-CoV-2 virus is primarily transmitted through droplets when sneezing and coughing, but it can also spread indirectly and these particles can remain in the air for some time. It is assessed as a virus that spreads rapidly, although its spread can be significantly influenced with the help of preventive measures such as hand washing, avoiding contact with the infected, early detection and isolation of the infected patient. Five hospitals participated in a SARS study

conducted in Hong Kong and it was revealed that staff who adopted all four protective measures like masks, gloves, gowns and handwashing remained healthy. Staff who disregarded at least one of these practices became infected, but the wearing of masks was the most significant measure given that other three measures showed no additional significant protection to mask wearers, therefore stopping droplet transmission at the face level is critical (15). Given that the incubation period is estimated between 2 and 14 days and due to the occurrence of asymptomatic cases, they declared wearing protective masks an important preventive measure. Many studies and systematic reviews with meta-analysis had shown significant association between face mask use and SARS-CoV-2 infection. The results are showing that face mask provides protection from infections and is linked with a reduced risk of an infection. In addition, airborne simulation experiments have shown that cotton masks, surgical masks and N95 masks had a protective effect in terms of transmission droplets/aerosol and that the protective efficiency was higher when masks were worn by the spreader of the virus (3,12,23). Furthermore, habit of wearing a mask and the correct way of wearing it was showed to be an important factor for decreasing a risk of an infection. In studies from 2011, 2013, 2015 and 2019, the results showed that respirators should be worn during the entire shift in order to provide the best protection (3). Use of respirators and masks only when it comes to high-risk procedures has not been shown to be protective. Several studies have found the SARS-CoV-2 virus in air samples in surroundings in intensive care units and COVID-19 wards for at least 3 hours after aerosolization, which supports the results that protective masks and respirators must be used continuously (3). However, aerosol generating procedures have not been shown to increase infection associated with aerosol transmission, and in some cases the high infection rate can be related to poor adherence to standard precautions, and may also be related to high levels of exposure to virus from droplet clouds rather than transmission of indications by air route (24,25). Also, the fit of the masks is very important to consider for protecting yourself against COVID-19. It should fit tightly enough to create a seal but comfortably enough to prevent frequent repositioning. In general, a mask is less helpful if it is not covering the nose and mouth. Frontline healthcare workers have significant exposure to SARS-CoV-2 during the work and infected healthcare work-

ers can further transmit the virus to patients if protective equipment is not worn correctly or if hand hygiene is poor (26). Moreover SARS-CoV-2 droplets can be transmitted by direct contact or smear transfection modality when hands are contaminated by touching the nose or face, thereby coming into direct contact with others, e.g. by shaking hands or touching the mask and touching nearby objects (27). Masks should also be disposed after some time of wearing, after single use for 4-6 hours if continuously used. Breathing dampens the mask, and when there is excessive moisture, the mask becomes airtight so it loses its protective effect for the wearer and the environment, also pathogens can accumulate in the mask which means masks should be replaced regularly (18,22). If the mask gets moist or wet, it should be thrown away and replaced immediately and should never be washed with soap and water or disinfected with alcohol and reused, because it neutralizes the electrostatic charge of the filter layer and compromises its structural integrity (18). The cloth masks can be washed with soap and water and reused till the fabric is intact (7). In reviewed researches, it was shown that respirators are slightly more effective than surgical masks, but the difference has shown itself insignificant. Surgical mask can be more protective than cloth masks, although it all depends on the layers and material that masks are constructed of. Any mask can decrease the number of microorganisms in some manner. Measurement of material filtration efficiencies can provide initial guidance on potential mask effectiveness for preventing outward and inward transmission (28). There is a need for additional researches and studies with a higher number of subjects, control groups and types of masks positioned in various conditions. Masks and respirators made of materials with larger pore sizes, such as cotton and synthetic fabric, will not be able to effectively filter viruses compared to those made of materials with smaller pore sizes. Masks and respirators made of or coated with water-resistant materials are more effective against large virus-laden respiratory droplets and fluid spills (15,28,29). Regarding non-medical masks made of different materials, giving general indications on the choice of materials and their composition is difficult because it is not possible to evaluate the efficiency for filtering different liquids or particles that can be emitted when breathing, sneezing or coughing in different environmental conditions. This is important to point out because the air flow rate, temperature, humidity and duration of

use of the mask can affect the efficiency of the filter media (30). According to the American Society of Testing and Materials (ASTM) F2100 standard, there are specific performance requirements for materials used in medical face masks (15). These are particulate filtration efficiency (PFE), bacterial filtration efficiency (BFE), fluid resistance, differential pressure and flammability. As face masks are important part of the personal protective equipment for medical use, these characteristics ensure consistency in mask production and valid efficiency of face masks (15,30). While the wearing of masks is undeniably vital in reducing the risk of viral respiratory illness, staff on the ground have noted consequences with regards to the feasible application of therapeutic interventions and patient-clinician relationships as well as the well-being and resilience of both patients and staff (20). In covering a significant proportion of the face, which creates a physical barrier to effective communication, masks could pose a substantial psychological barrier to the development of therapeutic relationships, as relentless lack of familiarity and personal connection can evoke feelings of loneliness and isolation, the disruption of non-verbal communication due to the loss of facial expression recognition under the mask can also increase feelings of insecurity and discouragement (16,17). It can lead to misjudging situations as well as delayed and incorrect response. Also, some perceived interferences of integrity, self-determination and autonomy, coupled with discomfort, often contribute to substantial distraction and may ultimately be combined with the physiologically mask related decline in psychomotor abilities, reduced responsiveness and an overall impaired cognitive performance. To compensate for the effects of mask wearing, the staff should invest more time and effort to establish effective channels of communication (31,32).

Conclusion

For preventing droplet transmission from infected individuals, surgical mask should be the first choice for the community and a cloth mask should only be advised as a last resort if surgical masks are not available. However, cloth masks are better than no mask

at all. For a health care worker, the double layer surgical mask or a respirator are advised in all routines and general procedures. Following other protective measures is also important in reducing a risk of spreading the infection, as wearing masks responsibly and correctly during all times that is needed. The most common side effects when wearing masks for a long time are increased production of sputum, cough and dyspnea. In addition to the physical barrier and difficult communication, masks are associated with difficulties in the implementation of therapeutic procedures and disrupt the connection between patients and health professionals.

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USPOREDBA UČINKOVITOSTI RAZLIČITIH VRSTA ZAŠTITNIH MASKI U SMANJENJU PRIJENOSA VIRUSA SARS-CoV-2: PREGLEDNI RAD

Sažetak

Uvod. Zaštitna oprema postala je globalno korištena za zaštitu od respiratornih infekcija kod zdravstvenih radnika i bolesnih pacijenata. S pojavom virusa SARS-CoV-2 i globalnom pandemijom, uloga zaštitnih maski u smanjenju prijenosa novog virusa postala je predmetom mnogih istraživanja. Iako zaštitna maska ima važnu ulogu u smanjenju prijenosa infekcija, njezino nošenje ima i određene neželjene učinke.

Cilj. Prikazati učinkovitost različitih vrsta zaštitnih maski u smanjenju prijenosa virusa SARS-CoV-2, kao i usporedbu neželjenih učinaka pri nošenju zaštitnih maski.

Metode. Analiza teme o učinkovitosti zaštitnih maski uključivala je preglede radova na tražilici Google te baza podataka Medline (putem PubMeda) i Hrčak. U analizu su uključeni znanstveni radovi s kliničkim ispitivanjima ili pregledni radovi, na engleskom i hrvatskom jeziku, bez obzira na metodologiju, objavljeni od 2020. Uključeni radovi sadrže teme kao što su medicinske maske, respiratori, platnene maske i njihovi materijali, učinkovitost i važnost korištenja te neželjeni učinci nošenja zaštitnih maski. Pronađeno je 2110 članaka, originalnih i preglednih radova, od kojih je nakon detaljnog čitanja i analize više autora odabrano 11 koji zadovoljavaju uključujuće kriterije za potrebe ovog preglednog rada.

Rezultati. Razlikuju se filtarske polumaske s ventilima ili bez njih, kirurške maske te higijenske ili platnene maske. Kirurška maska može biti bolja zaštita od platnene maske, iako to može ovisiti o slojevima i materijalu od kojeg je maska izrađena. Maske respira-

tori nešto su učinkovitije od kirurških maski, no razlika se pokazala neznatnom. Najčešći su neželjeni učinci pri dugotrajnom nošenju maski pojačana produkcija sputuma, kašalj, dispneja, otežana komunikacija, nedostatak bliskosti i osjećaj nesigurnosti.

Zaključak. Maska za lice štiti od infekcija i povezuje se sa smanjenim rizikom od infekcije. Navika nošenja maske i pravilan način nošenja pokazali su se važnim čimbenikom za smanjenje rizika od infekcije.

Ključne riječi: zaštitna oprema, učinkovitost zaštitnih maski za lice, nuspojave nošenja maski, SARS-CoV-2, infekcija

Pain Assessment in Pediatric Patients - A Literature Review

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Abstract

Introduction. Pain is an unpleasant sensory and emotional experience caused by existing or possible tissue damage. Pediatric patients are a sensitive group whose experience of pain is influenced by various other factors, so the assessment and treatment of pain itself is of a different nature than adults. Correct assessment of pain enables adequate treatment and alleviation of complaints.

Aim. The aim of the paper was to perform a systematic review of the literature related to the assessment of pain in pediatric patients and to gather available knowledge on the reliability and validity of certain pain assessment methods in one place.

Methods. The PubMed database was searched with the aim of finding studies indicating the reliability and validity of the Wong-Baker, VAS, COMFORT and FLACC scales. Included papers are systematic reviews, review articles and research papers published in the period from 2000 to 2020. Languages that were acceptable for the inclusion were English and Croatian. Keywords used for searching the database were pain assessment, pediatrics and pain scales.

Results. According to the inclusion criteria for this paper, 9 studies were used in which pediatric patients from birth to 18 years of age were included. The guidelines indicate the clinical reliability of the listed scales with guidance on which scales are better to use in which cases. Pain assessment scales have been proven by research to be a good indicator of pain in children, whether self-reported with the VAS or Wong-Baker scale or assessed by a medical professional with the FLACC, COMFORT or EVENDOL scale.

Conclusion. Researches recommend the VAS scale for older children, while the Wong-Baker scale is suitable for children up to 7 years old. The COMFORT scale has been clinically validated, the FLACC scale is both valid and reliable, particularly for children up to 7 years old. The EVENDOL scale is recommended in emergency cases involving children up to 8 years old.

Introduction

Pain is a subjective feeling of the patient which is associated with actual or threatened tissue damage. Since pain is not a measurable parameter, the medical staff must believe the patient whenever they say they are in pain, document it and treat it properly (1). Pain is influenced by various factors such as age, fatigue, fear, neurological function and method of treatment. It should be taken into account that pediatric patients may experience stronger pain during routine care due to fear, misunderstanding of the reasons behind certain procedures and lack of adaptation to a new routine (2). In order to be able to achieve adequate treatment of pain, first of all, it is necessary to assess it in the right way. The assessment of pain in pediatric patients includes a set of skills by the nurse that will help her to obtain information about the intensity and location of pain. This assessment depends on the child's age and level of understanding (3). The literature states that children do not understand pain until their first year of life (in the so-called sensorimotor period), but they certainly experience it and remember these experiences. At that age, it is important that the child receives optimal pain management in order to prevent negative responses to painful stimuli in the future. After the second year of life, the child's understanding of pain develops. From age 2 to 7, children do not understand the causes and consequences of pain, they think that pain is a form of punishment and perceive pain as a physical experience that can suddenly disappear. From age 7 to 12, children can already specify the location of pain, they have an increased awareness of their body and understand causes and consequences of pain. During puberty, children understand the

importance of pain management and value privacy, honesty and like to feel in control. It is important to take these parameters into account during the assessment so that medical professionals can approach the patient in an appropriate way and collect information about the pain as best as possible (3). When the child is able to self-assess pain, the Visual Analogue Scale (VAS) or the Wong-Baker Face Scale is used. If the child is younger, does not understand the mentioned scales or is unable to state the amount of pain they feel, scales are used by which medical professionals can conclude the child's pain. Two scales that are often used when working with pediatric patients are the COMFORT and the FLACC scale. The COMFORT scale consists of 8 indicators: alertness, calmness, respiratory response, movements, blood pressure, pulse, muscle tone and facial muscle tension. Each indicator is scored with points from 1 to 5, and the scale is most often used in intensive care units due to the need for measuring blood pressure and pulse (4). The "Face, Legs, Activity, Cry and Consolability", or the so-called FLACC scale, consists of 5 items: facial expressions, position of the legs and leg tension, activity, crying and level of calmness. These items are scored from 0 to 2 and the highest overall score is 10. The scale was originally intended to measure postoperative pain in pediatric patients (5). Along with the use of these scales, the need arose in the pediatric emergency department for a scale that can be used in emergency cases, which will be easy to understand, and which will define the level of pain, facilitate the prescription of analgesics and enable evaluation after administering analgesia. For this purpose, scientists have developed the newer EVENDOL scale. This scale is based on scoring at 4 levels. Items that are scored are: verbal expression of pain, facial expressions, movements, posture and interaction with the environment. The highest overall score can be 15 (6).

Aim

The aim of this study is to gather knowledge about ways to assess pain in pediatric patients by reviewing the available literature, to conclude which scale

is better to use in certain cases and to discover the advantages and disadvantages of certain scales.

Methods

During the process of searching the biomedical database PubMed, studies that were found and included in this literature review were studies describing the reliability and validity of the Wong-Baker, VAS, COMFORT, FLACC and EVENDOL scale.

The articles were selected according to the inclusion criteria: the article had to fall under the categories of a systematic review, review article or original research paper. The keywords used were pain assessment, pediatrics, and pain scales. The publication years had to be between 2000 and 2020, and the articles had to be published in Croatian or English. Participants that were chosen were from the Intensive care unit, Pediatric department, Maternity hospital and the Emergency department. The participants included were male and female from age 0-18 years old (Table 1).

The exclusion criteria were: letters and editorials, keywords unrelated to the topic, articles published prior to 2000, articles in languages other than Croatian or English, other departments and participants over 18 years old (Table 1).

Results

The review included 11 significant studies that met the inclusion criteria (Table 1). Pediatric patients aged from 0 to 18 years were included in the research. The research was conducted in pediatric intensive care units preoperative, postoperative, in the burn clinic, the maternity hospital and the emergency department.

Garra G. et al. investigated 120 pediatric patients aged 10-15 years to reveal the correlation between

Table 1. Inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Type/category of the article	Systematic review Review article Original research paper	Letters Editorials
Content (keywords)	Pain assessment Pediatrics Pain scales	Other
Publication date	2000-2020	Articles published before 2000
Language	Croatian, English	Other
Sample location	Intensive care unit Pediatric department Maternity hospital Emergency department	Other
Participants age	0-18 years old	>18 years old
Participants sex	Male, female	/

the VAS and the Wong-Baker scale. First, the researchers explained the Wong-Baker scale to the patients, then they recorded the answers, and after that they repeated the procedure with the VAS scale. After implementing both scales on all patients, they collected the data and set the mean values of the VAS scale results under each face of the Wong-Baker scale. It has been proven that the VAS has an excellent correlation in older children with acute pain, while the Wong-Baker scale is better in younger children. There are many factors that influence the accuracy of pain assessment using the VAS scale in pediatric patients. The barriers are that children do not have an idea what "the greatest possible pain" means, they often cannot understand the scale itself and can confuse pain with fear (7).

A study conducted in two African hospitals by Bosenberg A. et al. aimed to evaluate the validity of the

Wong-Baker scale as a method of postoperative pain assessment. The study included 110 children aged 4-12 who were scheduled for surgery. There were two assessments, one where children assessed their pain using the Wong-Baker scale and the second where experienced nurses assessed the level of pain of the same children by observing them. The assessment was performed every hour during the 8-hour postoperative period. The correlation between the results obtained through the Wong-Baker scale and the observation is significant. The most similar results are for children aged 6 and 7, and the most different for children aged 8-12. This research confirms the previous one where it was proven that the Wong-Baker scale is better for use in younger children (8).

Pediatric Units in the Netherlands wanted to find out whether the observational VAS has the same value as the self-assessment VAS scale. The validity of the observational VAS is questionable. Research shows that scores between the two scales are different for postoperative pain and chronic pain. In assessing postoperative pain, medical professionals and parents underestimated the children's pain, while with chronic pain, they overestimated the pain and gave a higher score than the one given by the child (9).

A study conducted in Rotterdam aimed to test the reliability and validity of the COMFORT scale as a way of assessing postoperative pain. They had a sample of 158 children aged from birth to 3 years who were admitted to the hospital for surgery in the thoracic or abdominal region. Pain was measured with the COMFORT and VAS scale before surgery and during 36 hours after surgery with a total of 13 measurements. The results support the use of the COMFORT scale as a way of assessing postoperative pain in newborns and children up to 3 years of age. The limitation of this research is that both scales were administered by the same nurse for practical reasons, so it is questionable whether the results would have been different if the scales had been administered by different nurses (10).

The European Journal of Pain published a systematic review of available research related to the clinical significance of the COMFORT scale in pediatric patients. The review included 30 studies that met the criteria, 20 of which were conducted in the pediatric intensive care unit, and the other 10 in the operating room, the burn clinic, and the maternity ward. Research has shown that the COMFORT scale is reliable for assessing sedation and pain, with validity evi-

dence ranging from moderate to excellent for sedation and weak to excellent for pain. This systematic review of available research has proven the clinical relevance of the COMFORT scale, but more research is needed to confirm how useful this scale is for pain assessment (11).

Nilsson S. et al. conducted research in a Swedish hospital with a sample of 80 children aged from 5 to 16 years. The aim was to find out the reliability and validity of the FLACC scale as a way of assessing pain during the insertion of a peripheral venous cannula and an internal central venous catheter. The results of medical professionals who assessed pain using the FLACC scale were compared with the results of children who assessed their pain using the CAS (Coloured Analogue Scale) and the FAS scale (Facial Affective Scale) before, during and 5 minutes after the procedure. The research proved the reliability and validity of the FLACC scale as a way of assessing pain in the mentioned procedures (12).

Shen J, Giles S.A. et al. selected 24 nurses working in a Pediatric Burn Center to determine the reliability of the FLACC scale in burn patients and the influence of the length of nurse service on scoring accuracy. Nurses were shown 4 videos of pediatric burn patients with burns that varied from moderate to severe pain 3 times in different orders and on different days. The nurses then rated the pain using the FLACC scale. The results showed that nurses have a hard time distinguishing between moderate and severe pain, and that nurses with less than 5 years of work experience have a higher accuracy in evaluation using the FLACC scale. It is believed that this is due to the desensitization of more experienced nurses caused by stress and emotionally demanding work (13).

Lempinen H. et al. conducted a study with the aim of verifying the feasibility and clinical utility of the FLACC scale in pediatric intensive care unit patients. They worked on 157 cases of children, whose pain was measured by 50 nurses. Pain assessment was carried out in children at rest, postoperatively, during routine care and during short-term painful procedures. After each assessment, the nurse had to answer a questionnaire about the feasibility and usefulness of the FLACC scale. In most cases, nurses agreed that the structure of the scale itself is clear (97%), it is technically easy to use (98%) and does not take too much time (87%). Also, they came to the conclusion that the FLACC scale is the best for chil-

Table 2. Overview of researches included in the paper

Research	Aim	Subjects	Scale	Results
Garra G. et al, 2009 (7)	To investigate the correlation between the Wong-Baker and the VAS scale	Children aged 8-17 years N=120	WONG-BAKER SCALE VAS	The Wong-Baker scale is better in younger children. VAS is better in older children.
Bosenberg A. et al, 2003 (8)	To investigate the validity of the Wong-Baker scale	Children aged 4-12 years N=110	WONG-BAKER SCALE	The Wong-Baker scale is a valid scale for assessing pain in children, better to use in younger children.
Van Dijk M. et al, 2002 (9)	To investigate the validity of the observational VAS scale in relation to the subjective VAS	Children aged 0-18 years N=884	VAS (observational) and VAS (subjective assessment)	The validity of the observational VAS is questionable.
Van Dijk M. et al, 2000 (10)	To investigate the validity and reliability of the COMFORT scale as a postoperative pain assessment method	Children aged 0-3 years N=158	COMFORT SCALE VAS (for comparison)	The COMFORT scale is a valid and reliable way of assessing pain in newborns and children up to 3 years of age.
Maaskant J. et al, 2016 (11)	To investigate the clinical significance of the COMFORT scale as a way to measure sedation and pain	Children aged 0-18 years 30 research papers	COMFORT SCALE	The COMFORT scale is a reliable way to assess sedation, evidence is mixed for pain assessment - more research is needed.
Nilsson S. et al, 2008 (12)	To investigate the validity and reliability of the FLACC scale during procedures	Children aged 5-16 years N=80	FLACC SCALE	The FLACC scale is a valid and reliable way to assess pain during procedures.
Shen J. et al, 2017 (13)	To investigate the reliability of the FLACC scale in patients with burns and the dependence of the employee's work experience on the accuracy of the assessment	Pediatric nurses N=24	FLACC SCALE	It is difficult to distinguish between moderate and severe pain. Nurses with less work experience have more accurate results.
Lempinen H. et al, 2020 (14)	To investigate the feasibility and clinical utility of the FLACC scale in a pediatric intensive care unit	Children aged 0-16 years N=157	FLACC SCALE	The structure of the scale is clear, easy to use and does not take too much time. The greatest clinical utility is in children aged 1-7 years.

Research	Aim	Subjects	Scale	Results
Kochman A. et al, 2017 (15)	1. Investigate the reliability of the results with different respondents 2. Investigate the change in results when applying analgesia	Children aged 6 months-5 years N=101	FLACC SCALE	The scale is reliable regardless of which examiner administers it. The scale is an effective way of checking pain during the application of analgesia in children.
Fournier-Charrière E. et al, 2012 (16)	To investigate the validity and feasibility of the EVENDOL scale for use in pediatric emergency medicine units	Children aged 0-7 years N=291	EVENDOL SCALE	A valid way to assess pain in pediatric patients in the emergency department (proven in comparison with other scales and evaluation after analgesic administration). Simple to fill out and feasible in the accelerated work of the emergency department staff.
Beltramini A. et al, 2019 (17)	To investigate the validity and feasibility of the EVENDOL scale for use in outpatient emergencies	Children up to 8 years N=422	EVENDOL SCALE	Simple, quick to use, easy to understand. Recommended for use in emergency conditions compared to other scales.

dren aged 1-7 years, while it was more difficult to apply for children under one year (69%, n=37) (14).

The research on the FLACC scale made by Kochman A. et al. was conducted in 2 phases. The first phase was carried out with the aim of insight into the reliability of the scale results with different examiners. 66 children between age 6 months and 5 years were included, and 2 examiners examined pain in the same children one after the other using the FLACC scale without insight into other people's results. The results from both examiners were the same, which proves that the scale is reliable regardless of the examiner who administers it. The second phase of the study aimed to detect a change in results after the administration of analgesia. For this phase, they took a sample of 35 patients for whom they filled in the scale before the application, 30 and 60 minutes after the application of analgesia. The results showed that pain decreases after the application of analgesia, with the average score on the scale before analgesia being 5.54, after 30 minutes 2.00, and after 60 min-

utes 1.14, which means that the FLACC scale is an effective way of checking pain during analgesia (15).

A team of French pediatric pain experts designed the EVENDOL scale to assess pain in pediatric patients in the emergency department. They then conducted it on children up to 7 years old to find out if the scale is valid and feasible to use. 291 children from 4 French hospitals were included, 49% of which were admitted to the emergency room due to traumatic injury, 39% due to painful pathologies and 16% due to other difficulties (fever, rash, etc.). Pain was measured in each group separately, before and after the administration of pain-relieving drugs, and the results of all groups were lower after the administration of drugs. The results of the EVENDOL scale were also compared with the results of other pain scales (FLACC, CHEOPS and TPPPS) and the correlation coefficient between the scales was higher than 0.7. The feasibility of the scale was measured by involving 30 nurses in evaluating which scale was the easiest for them to use. They concluded that the EVENDOL scale is easy to

complete and appears to be a good tool for monitoring pain levels (16).

Beltramini A. et al. conducted research on the EVENDOL scale. They included 422 patients up to 8 years of age in their study. The doctor and nurse from that department individually assessed the children's pain by first filling in the numerical pain scale and then the EVENDOL scale. After the obtained results, it was concluded that the EVENDOL scale is reliable and valid for use in emergency outpatient cases because it is simple and quick to use and easy to understand. The literature states that in these conditions it is best to use the EVENDOL scale for pain assessment in children up to 8 years of age, and the VAS scale for children over 8 years of age (17).

Discussion

The purpose of this research was to find out which scales are reliable for use in the assessment of pain in pediatric patients by reviewing the literature and drawing relevant conclusions. Assessing pain in pediatric patients is a complex procedure that requires a set of skills that the medical professional must adopt in order to accurately diagnose the cause of pain and determine the appropriate treatment method depending on the type of pain. Pain assessment is usually done before starting the patient's treatment, during the treatment and during the evaluation to see if there is a shift in the intensity of the pain and if it is necessary to change the therapy. If the assessment of pain in all these steps is done correctly, there should be a positive shift in the quality of life, the preservation of physiological functions and the avoidance of negative outcomes. It should be taken into account that every patient is different, so his experience of pain can be expressed in different ways. When assessing pain, it is therefore very useful to use pain scales through which localization, rhythmicity, duration and quality of pain will be assessed (18).

A study by Garra G. et al. that included a comparison of the results of the Wong-Baker and the VAS scale showed that the Wong-Baker scale is better for use in younger children (7). The same was confirmed in the research of Bosenberg A. et al, where the results

of the Wong-Baker scale compared to the observational assessment of pain showed that the results were most similar in children under 7 years old (8). Research by Garra G. et al. also shows that the VAS pain scale has an excellent correlation in older children with acute pain, while in younger children there are limitations due to their lack of understanding of the scale and the inability to distinguish between pain and fear (7). Dutch research that compared observational VAS and subjective VAS indicated that observational VAS does not give the same results as subjective VAS, which is why its accuracy is questionable (9). The clinical significance of the COMFORT scale was proven in two studies (10,11) in terms of pain assessment and sedation of pediatric patients in the operating room, the burn clinic and in the maternity ward, but the validity of the scale itself is not confirmed yet. As for the FLACC scale, research shows that it is a valid and reliable way of assessing pain during procedures (12), when applying analgesia (15), and has the greatest clinical utility in children aged 1-7 years (14). The research of Shen J. et al. states that it is difficult to differentiate between moderate and severe pain when applying the FLACC scale and that nurses with less work experience have more accurate results (13), while another study conducted in the same year (15) shows that the scale is reliable regardless of which examiner conducts it. Research related to the EVENDOL scale recommends the use of this scale in emergency medicine units as well as in outpatient emergencies. The scale is valid and reliable, which is proven by comparison with other scales, simple and quick to use, and the guidelines even recommend it as the best scale for use in emergency situations with children up to 8 years of age.

Guidelines from 2017 based on the most significant evidence on the validity of certain pain assessment scales recommend the use of the VAS scale as the gold standard in the assessment of pain in children over 6 years of age. In children under 6 years of age, it is recommended to use the FLACC and EVENDOL scale to assess acute and procedural pain. The EVENDOL scale is reliable for assessing pain in newborns and premature infants, while the FLACC is not. To assess pain in sedated and unconscious children, they recommend using the COMFORT scale (6).

The limitations of the mentioned results are on how reliable the mentioned scales are, how to differentiate between moderate and severe pain and how much influence the nurse's experience has on the

results themselves. Further research is needed to assess the above. In addition to treating pain with pharmacological methods, it should be taken into account that pain can be influenced by numerous other factors due to the very psychological nature of pain. The research of Kovačević I. et al. states that social support is associated with a better general health condition and a reduction in pain. It has been shown that emotional support from family and loved ones combined with sufficient information about one's illness and good communication with health professionals leads to easier acceptance of pain and better coping with it. This kind of information provides a broader picture of the complexity of pain and health-care workers must take it into account during treatment if they want the patient to have the best possible outcome (19).

Conclusion

The expression of pain in children depends on the child's level of understanding, which is why it is necessary to know which pain assessment scale to use depending on the situation. The review of the available literature on the effectiveness of the VAS, Wong-Baker, Comfort, FLACC and EVENDOL scales found significant evidence in favor of using the VAS scale in older children, while the Wong-Baker scale is good for use in younger children up to 7 years of age. The COMFORT scale is proven to be clinically significant, and the FLACC scale is a valid and reliable scale and has the greatest clinical utility in children up to 7 years of age. The EVENDOL scale is recommended as a good way to assess pain in emergency cases in children up to 8 years of age. The use of scales is proven to be an effective way of assessing pain in pediatric patients, but it is necessary to further investigate the advantages and potential disadvantages of individual scales.

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PROCJENA BOLI U PEDIJATRIJSKIH BOLESNIKA - PREGLED LITERATURE

Sažetak

Uvod. Bol je neugodno osjetilno i emocionalno iskustvo uzrokovano postojećim ili mogućim oštećenjem tkiva. Pedijatrijski su pacijenti osjetljiva skupina na čije doživljavanje boli utječu razni drugi čimbenici, stoga je sama procjena i liječenje boli drugačije prirode nego kod odraslih. Pravilna procjena boli omogućuje adekvatno liječenje i ublažavanje tegoba.

Cilj. Provesti sustavni pregled literature vezane uz procjenu boli u pedijatrijskih bolesnika te prikupiti raspoložive spoznaje o pouzdanosti i valjanosti pojedinih metoda procjene boli.

Metode. Baza podataka PubMed pretražena je u cilju pronalaženja studija koje ukazuju na pouzdanost i valjanost ljestvica Wong-Baker, VAS, COMFORT i FLACC. Uvršteni su sustavni pregledi, pregledni članci i znanstveni radovi objavljeni u razdoblju od 2000. do 2020. Jezici prihvatljivi za uključivanje bili su engleski i hrvatski. Ključne riječi upotrijebljene za pretraživanje baze podataka bile su: procjena boli, pedijatrija i ljestvice boli.

Rezultati. Prema kriterijima uključivanja u ovaj rad korišteno je devet studija u koje su bili uključeni pedijatrijski bolesnici od rođenja do dobi od 18 godina. Smjernice ukazuju na kliničku pouzdanost navedenih ljestvica s uputama koje je ljestvice bolje primjenjivati u kojim slučajevima. Istraživanje je pokazalo da su ljestvice za procjenu boli dobar pokazatelj boli kod djece, bilo u slučaju samoprocjene s pomoću ljestvice VAS ili Wong-Baker bilo kada procjenjuje medicinski

stručnjak s pomoću ljestvice FLACC, COMFORT ili EVENDOL.

Zaključak. Istraživanja preporučuju ljestvicu VAS za stariju djecu, dok je ljestvica Wong-Baker primjerena za djecu u dobi do sedam godina. Ljestvica COMFORT klinički je validirana, ljestvica FLACC i valjana je i pouzdana, posebno za djecu u dobi do sedam godina. Ljestvica EVENDOL preporučuje se u hitnim slučajevima kod djece u dobi do osam godina.

Ključne riječi: procjena boli, pedijatrija, skala boli

Author Guidelines

AIM AND SCOPE

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Double spacing should be used throughout, including the title page, abstract, text, acknowledgments, references, individual tables, and legends. Pages should be numbered consecutively, beginning with the title page. The page number is to be written in the lower right-hand corner of each page. Manuscript must not exceed 20 pages (7500 words) including the abstract, text, references, tables and figures. The text should be accompanied by the title page as a separate page.

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Abstract and Key Words

The first page should contain the title and the abstract (summary) both in English and Croatian, of no more than 200 -250 words each.

The abstract should state the purposes of the study or investigation, basic procedures, main findings, and principal conclusions. It should emphasize new and important aspects of the study or observations. Below the abstract, the authors should provide 3 to 8 key words or short phrases that will assist in cross-indexing the article and may be published with the abstract. Terms from the Medical Subject Headings (MeSH) list of Index Medicus should be used for key words.

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Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. Include in the Discussion section the implications of the findings and their limitations, including implications for future research, but avoid unqualified statements and conclusions not completely supported by the data. Relate the observations from your study to other relevant studies. State new hypotheses when warranted, but clearly label them as such.

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Acknowledgments

List all contributors who do not meet the criteria for authorship, such as a person who provided purely technical help, writing assistance, or a department chair who provided only general support. Financial and material support should also be acknowledged.

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