

Povijesni razvoj i aktivnosti Koronarne jedinice Opće bolnice Bjelovar

Historical Development and Work of the Coronary Care Unit of Bjelovar General Hospital

 Ružica Prpić*

 Andreja Čleković-Kovačić

Opća bolnica Bjelovar,
Bjelovar, Hrvatska

Bjelovar General Hospital,
Bjelovar, Croatia

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SAŽETAK: Razvoj kardiološke djelatnosti u okviru Službe internističkih djelatnosti Opće bolnice (OB) Bjelovar započeo je 1957. godine nabavom prvog elektrokardiografskog aparata. Sa svrhom podizanja skrbi o kardiološkim bolesnicima, 1974. otvorena je Koronarna jedinica, tada sa samo dva kreveta. U međuvremenu, Koronarna jedinica je proširena (u sklopu Internističke jedinice intenzivnog liječenja) pa tako danas ima sedam kreveta uz sedam kreveta postintenzivne/postkoronarne njege. Opremljena je suvremenim monitorinškim jedinicama za centralni nadzor, kao i propisanom, u više navrata moderniziranom, aparaturnom opremom. Liječnici Službe internističkih djelatnosti OB Bjelovar formirali su 2001. godine Bjelovarski registar akutnog infarkta miokarda koji sadržava elektroničke zapise ciljanih anamnestičkih, laboratorijskih, kliničkih i farmakoterapijskih podataka prikupljenih pri prijmu, liječenju i otpustu bolesnika. U vrijeme osnutka Bjelovarski je registar, uz registar Poliklinike za prevenciju kardiovaskularnih bolesti i rehabilitaciju u Zagrebu, bio jedini registar oboljelih od infarkta miokarda u Hrvatskoj te jedini bolnički registar koji je sadržavao podatke o farmakoterapiji bolesnika. Uključivanjem Bjelovarsko-bilogorske županije u Hrvatsku mrežu intervencijskog liječenja akutnog infarkta miokarda 2005. godine omogućeno je liječenje bolesnika na najefikasniji način – perkutanom koronarnom intervencijom. U razdoblju od 2010. do 2018. prosječno se godišnje uputilo 200 bolesnika na invazivne zahvate u Klinički bolnički centar Zagreb, Kliničku bolnicu Merkur, Specijalnu bolnicu Magdalena i Kliničku bolnicu Dubrava. U posljednjih je nekoliko godina uočljivo znatno povećanje broja bolesnika obrađenih u Koronarnoj jedinici (kronarna/postkronarna skrb) OB Bjelovar pa su tako 2018. godine obrađena 402 bolesnika.

SUMMARY: The development of cardiological treatment as part of the Department of Internal Medicine at the Bjelovar General Hospital (GH) started in 1957 with the acquisition of the first electrocardiography device. In order to improve care for cardiologic patients, the Coronary Care Unit was opened in 1974, with only two beds at the time. The Coronary Unit has since been expanded (as part of the Internal Medicine Intensive Treatment Unit), and now comprises seven beds with an additional seven beds for postintensive/postcoronary care. It is equipped with modern monitoring devices for central monitoring as well as mandated and repeatedly modernized mechanical equipment. The physicians at the Department of Internal Medicine at the Bjelovar GH formed the Bjelovar registry for acute myocardial infarction in 2001, which contains digital record of specific medical history data, laboratory findings, and clinical and pharmacotherapy data gathered during the presentation, treatment, and release of patients. At the time of its formation the Bjelovar registry was, along with the registry of the Zagreb Institute for Cardiovascular Prevention and Rehabilitation, the only registry for patients suffering for myocardial infarction in Croatia and the only hospital registry containing data on pharmacotherapy. Inclusion of the Bjelovar-Bilogora County in the Croatian Network for Interventional Treatment for Acute Myocardial Infarction in 2005 allowed treatment of patients in the most efficient way – with percutaneous coronary intervention. In the period between 2010 and 2018, an annual average of 200 patients were referred for invasive procedures to the University Hospital Centre Zagreb, the University Hospital "Merkur", the Special Hospital Magdalena, and the University Hospital Dubrava. A significant increase in patients treated at the Bjelovar GH Coronary Unit (coronary/postcoronary care) has been observed over the past several years, with for example 402 patients having been treated in 2018.

KLJUČNE RIJEČI: kardiologija, koronarna jedinica, akutni infarkt miokarda.

KEYWORDS: cardiology, coronary care unit, acute myocardial infarction.

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***ADDRESS FOR CORRESPONDENCE:** Ružica Prpić, Opća bolnica Bjelovar, Mihanovićeveva 8, HR-43000 Bjelovar, Croatia. / Phone: +385-91-7929947 / E-mail: ruzicaprpic@gmail.com

ORCID: Ružica Prpić, <https://orcid.org/0000-0002-5307-5466> • Andreja Čleković-Kovačić, <https://orcid.org/0000-0002-4532-3597>

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Povijesni razvoj

Službeni početak bolničke djelatnosti u Bjelovaru bio je 1845. godine, dok je Služba internističkih djelatnosti osnovana 7. lipnja 1925. godine. Početkom razvoja kardiološke djelatnosti u okviru Službe internističkih djelatnosti smatra se 1957. godina, kada je nabavljen prvi elektrokardiografski (EKG) aparat. Od tada pa do danas bolesti srca i krvnih žila, nažalost, dominantan su uzrok pobola i smrtnosti na širem području Bjelovara, a Bjelovarsko-bilogorska županija godinama prednjači po kardiovaskularnom mortalitetu. Navedeno je zahtijevalo i dinamičan razvoj kardiološke skrbi. Kao prvi veliki korak u podizanju skrbi o kardiološkim bolesnicima ističe se otvaranje Koronarne jedinice 1974. godine, tada sa samo dva kreveta¹. Koronarna jedinica bila je opremljena trima monitorima, dvama pisačima, jednim fiksnim elektrostimulatorom i jednim defibrilatorom. Prva uspješno provedena defibrilacija u Djelatnosti za interne bolesti bila je 1975. godine².

Poznajući i prateći epidemiološku situaciju te svjesni činjenice da su bolesti srca i krvnih žila glavni zdravstveni problem, bjelovarski su se kardiolozi sustavno počeli baviti i preventivnom kardiologijom³. Pod vodstvom internista kardiologa prim. mr. sc. Stipe Brzovića 1996. godine osnovano je Društvo za zaštitu srca i krvnih žila „Srce“ čiji se rad temeljio na prevenciji kardiovaskularnih bolesti, a dvije godine poslije Društvo je objavilo knjižicu *Prevenција koronarne bolesti u Bjelovarsko-bilogorskoj županiji*. U prostoru Društva omogućeno je sastajanje zainteresiranih građana jednom mjesečno sa svrhom kontrole arterijskoga tlaka te edukacije i prisustvovanja brojnim predavanjima o načinima sprječavanja nastanka koronarnih bolesti, kao i o čimbenicima rizika za njihov nastanak⁴.

Liječnici Djelatnosti za interne bolesti Opće bolnice Bjelovar predvođeni dr. Ivanušom 2001. godine formirali su Bjelovarski registar akutnog infarkta miokarda. Registar sadržava elektroničke zapise ciljanih anamnestičkih, laboratorijskih, kliničkih i farmakoterapijskih podataka prikupljenih pri prijmu, liječenju i otpustu bolesnika od rujna 1996. godine³. Zanimljiva je činjenica da je u vrijeme svojeg formiranja Bjelovarski registar akutnog infarkta miokarda, uz registar Poliklinike za prevenciju kardiovaskularnih bolesti i rehabilitaciju u Zagrebu, bio jedini registar oboljelih od akutnog infarkta miokarda u Hrvatskoj te jedini bolnički registar koji je sadržavao podatke o farmakoterapiji bolesnika¹. Od 2009. godine Registar nastavlja voditi dr. Čleković-Kovačić kao voditeljica Koronarne jedinice.

Kroz više prostornih i tehničkih rekonstrukcija (1983. i 2004.) Koronarna jedinica je proširena (u sklopu Internističke jedinice intenzivnog liječenja) na sedam kreveta uz sedam kreveta postintenzivne/postkoronarne njege. Opremljena je suvremenim monitorinškim jedinicama za centralni nadzor, kao i propisanom, više puta moderniziranom, aparaturom i opremom¹. Zalaganjem dr. Ivanuše i uz pomoć sponzora nabavljena su osobna računala za potrebe kardiološke djelatnosti i koronarne jedinice, i to mnogo prije nego je provedena bolnička informatizacija. Preko bolničke mreže omogućen je prijenos podataka i nalaza, čime je postao moguć pristup centralnom monitorskom sustavu Postkoronarne/postintenzivne skrbi preko bolničke mreže. U isto vrijeme podignuta je kvaliteta pružene medicinske skrbi na više razina. U rujnu 2005. godine integriran je softverski sustav *InternPol* u kojem su bili dostupni podatci o liječenju bolesnika na Internom odjelu, kao i sva internistička dijagnostička obrada⁵.

Historical development

The official beginning of hospital work in Bjelovar was in 1845, whereas the Department of Internal Medicine was formed on June 7, 1925. The acquisition of the first electrocardiography device in 1957 is considered the beginning of the development of cardiological work within the Department of Internal Medicine. Since then cardiovascular diseases have been and unfortunately still remain the dominant cause of morbidity and mortality in the wider Bjelovar area, and the Bjelovar-Bilogora County has for many years been a frontrunner in cardiovascular mortality. This situation required rapid and dynamic development of cardiological care. A significant first step was the opening of the Coronary Care Unit (CCU) in 1974, with only two beds at the time¹. The CCU was equipped with three monitors, two printers, one fixed-rate pacemaker, and one defibrillator. The first successful defibrillation at the Department of Internal Medicine was conducted in 1975².

Since Bjelovar cardiologists were closely monitoring the epidemiological situation and were well-aware of the fact that cardiovascular diseases were the main healthcare issue, they also started working on systemic cardiological prevention³. Under the leadership of internal medicine cardiologist and chief physician Stipe Brzović, MD, the "Heart Society" for Cardiovascular Protection was founded in 1996 with the aim of preventing cardiovascular diseases, and two years later the society published a booklet titled "Prevention of Coronary Diseases in the Bjelovar-Bilogora County". Monthly meetings of interested citizens were organized in the facilities of the society with the goal of controlling arterial pressure as well as education through attendance of numerous lectures on the methods of preventing the development of coronary diseases and the risk factors for their development⁴.

The physicians of the Department of Internal Medicine of the Bjelovar GH, led by Dr Ivanuša, formed the Bjelovar registry for acute myocardial infarction in 2001. The registry contains digital record of specific medical history data, laboratory findings, and clinical and pharmacotherapy data gathered during the presentation, treatment, and release of patients since September 1996³. An interesting fact is that at the time of its formation the Bjelovar registry for acute myocardial infarction was, along with the registry of the Zagreb Institute for Cardiovascular Prevention and Rehabilitation, the only registry for patients suffering for myocardial infarction in Croatia and the only hospital registry containing data on pharmacotherapy¹. Since 2009 the Registry has been led by Dr Čleković-Kovačić as the head of the CCU.

After several architectural and technical reconstructions (in 1983 and 2004), the CCU has been expanded (as part of the Internal Medicine Intensive Treatment Unit), and now comprises seven beds with an additional seven beds for postintensive/postcoronary care. It is equipped with modern monitoring devices for central monitoring as well as mandated and repeatedly modernized mechanical equipment¹. Thanks to the efforts of Dr Ivanuša and with the help of sponsors, two personal computers were acquired for the CCU significantly ahead of hospital-wide digitalization. The hospital network allowed the transfer of data and test results, which provided access to the central monitoring system for Postcoronary/postintensive Care via the hospital network. At the same time, the quality of the care being provided was improved on several levels. The *InternPol* software system was integrated in September 2005, which provided data on the treatment of patients at the Internal Medicine Department as well as all other internal medicine diagnostic processing⁵.

Bjelovarsko-bilogorska županija uključila se 2005. godine, zalaganjem dr. Ivanuše, u Hrvatsku mrežu intervencijskog liječenja akutnog infarkta miokarda. Time je omogućeno učinkovitije liječenje bolesnika s akutnim infarktom miokarda s elevacijom ST-segmenta (STEMI) metodom perkutane koronarne intervencije (PCI) s implantacijom stenta. Prvi su bolesnici na PCI upućeni već početkom 2006. u Kliničku bolnicu (KB) Dubrava u Zagrebu. Međutim, ubrzo nakon toga, bolesnici se počinju upućivati u Klinički bolnički centar (KBC) Zagreb, što je ostalo praksa i do danas. Od 2009. godine i svi bolesnici s akutnim infarktom miokarda bez elevacije ST-segmenta (NSTEMI) također se upućuju u KBC Zagreb uz prethodni dogovor faksom ili *e-mailom* (do tada isključivo dogovarano telefonski). Cijeli proces transporta bolesnika organiziran je uz potporu Bjelovarsko-bilogorske županije, u suradnji s Domom zdravlja Bjelovarsko-bilogorske županije koji osigurava sanitetsko vozilo s vozačem, dok OB Bjelovar osigurava pratnju liječnika i medicinske sestre. Povratak bolesnika s infarktom miokarda također pokrivaju liječnici i medicinske sestre Internog odjela OB Bjelovar. Trud i rad liječnika prepoznat je i šire pa je tako 2006. godine dr. Ivanuša postao urednikom službenog glasila Hrvatskog kardiološkog društva „Kardio list“, a 2009. i članom odbora urednika nacionalnih kardioloških časopisa Europskoga kardiološkog društva⁶.

Pod pokroviteljstvom Bjelovarsko-bilogorske županije 2009. godine dr. Klobučić pokreće formiranje Županijskog tima za prevenciju kardiovaskularnih bolesti¹.

Organizacija i aktivnost odjela

Služba internističkih djelatnosti OB Bjelovar, osim Koronarne i postkoronarne jedinice, obuhvaća kardiološku, pulmološku, gastroenterološku, endokrinološku, onkološku hematološku i nefrološku djelatnost, hemodijalizu te polikliničko-konzilijarnu djelatnost. Služba internističkih djelatnosti danas ima ukupno 81 krevet, od čega je 67 odjelnih i 14 koronarnih i postkoronarnih te 14 kreveta u dnevnoj bolnici.

Polikliničko-konzilijarna kardiološka djelatnost pokriva svu neinvazivnu dijagnostiku: 12-kanalni EKG, ergometriju, 24-satno snimanje EKG-a, 24-satno kontinuirano mjerenje arterijskoga tlaka, transtorakalnu ehokardiografiju te transezofagijski ultrazvuk.

Kardiološku djelatnost u Službi internističkih djelatnosti OB Bjelovar provode četiri liječnice specijalistice kardiologije te tri specijalizanta kardiologije, dok je trenutačno na supspecijalizaciji jedna liječnica.

Koronarna jedinica OB Bjelovar raspolaže sa 7 kreveta i 7 kreveta postkoronarne skrbi (**slika 1**). Kao i većina drugih, Koronarna jedinica opremljena je centralnom pontom s provedenim centralnim kisikom i vakuumom, a, uz Philipsove monitore za kontinuirano praćenje vitalnih funkcija, sadržava dva defibrilatora marke Zoll (**slika 2**), Braun infuzomate i perfuzor pumpe (**slika 3**), Oxylog, UZV srca te aspiratore. U cijelosti je opremljena centralnim nadzorom s neinvazivnim i invazivnim mjerenjem arterijskoga tlaka, saturacije kisika, elektrokardiograma, gdje se prije svega hospitaliziraju bolesnici s akutnim koronarnim sindromom, malignim poremećajima srčanog ritma, kao i hemodinamski nestabilni bolesnici s akutnim popuštanjem srca te svi ostali internistički bolesnici koji zahtijevaju intenzivnu skrb (npr. razna septična stanja, plućna embolija, gastrointestinalna krvarenja, akutna hemodijaliza i dr.)⁵.

Thanks to the efforts of Dr Ivanuša, the Bjelovar-Bilogora County joined the Croatian Network for the Interventional Treatment of Acute Myocardial Infarction in 2005. This allowed more effective treatment of patients with acute myocardial infarction with ST-segment elevation (STEMI) using percutaneous coronary intervention (PCI) with stent implantation. Patients were referred for PCI to the University Hospital Dubrava in Zagreb as early as the start of 2006. However, patients were later referred to the University Hospital Centre (UHC) Zagreb, which remains the standard practice today. Since 2009, all patients with acute myocardial infarction without ST-segment elevation (NSTEMI) are also referred to the UHC Zagreb with prior arrangements over fax or e-mail (all arrangements had previously been done by phone). The whole process of transporting the patients was organized with the support of the Bjelovar-Bilogora County in cooperation with the Bjelovar-Bilogora County Health Centre, which provided an ambulance vehicle and a driver, while the Bjelovar General Hospital provided then accompanying physician and nurse. The return trip for patients with myocardial infarction was also covered by physicians and nurses of the Internal Medicine Department of the Bjelovar GH. The efforts and work of these physicians was widely recognized, and in 2006 Dr Ivanuša became the editor of “Kardio list”, the official journal of the Croatian Cardiac Society, and a member of the committee of national cardiology journal editors of the European Society of Cardiology⁶.

Under the sponsorship of the Bjelovar-Bilogora County, Dr Klobučić initiated the formation of the County Team for the Prevention of Cardiovascular Diseases in 2009¹.

Organization and activities of the Department

In addition to the Coronary and Postcoronary Unit, the Department of Internal Medicine of Bjelovar GH encompasses cardiological, pulmonological, gastroenterological, endocrinological, oncological, hematological, and nephrological treatment, hemodialysis, and outpatient healthcare. The Department currently has a total of 81 beds, of which 67 are department beds, 14 are coronary and postcoronary beds, and 14 are day hospital beds.

Outpatient cardiac care covers all non-invasive diagnostics: 12-lead ECG, exercise stress test, 24-hour ECG monitoring, 24-hour ambulatory blood pressure monitoring, transthoracic echocardiography, and transesophageal echocardiography.

Cardiological work at the Department of Internal Medicine of Bjelovar GH is performed by four cardiologists, three cardiology residents, and one physician currently completing her subspecialization.

The Bjelovar GH CCU has 7 beds and 7 beds for postcoronary care (**Figure 1**). As most other units, the CCU is equipped with a central oxygen and vacuum system, Philips monitors for continuous vital function monitoring, two Zoll defibrillators (**Figure 2**), Braun infusion devices and perfusion pumps (**Figure 3**), an Oxylog machine, cardiac ultrasound, and aspirators. It is fully equipped for central oversight of invasive and non-invasive monitoring of arterial pressure, oxygen saturation, electrocardiograms, malignant heart rhythm disorders, and monitoring the state of hemodynamically unstable patients with acute heart failure and all other internal medicine patients who require intensive care (e.g. various states of sepsis, pulmonary embolism, gastrointestinal bleeding, acute hemodialysis, etc.)⁵.



FIGURE 1. Coronary Care Unit of Bjelovar General Hospital.



FIGURE 2. Defibrillator.



FIGURE 3. Infusion pumps for therapy.

Godine 2011. je Dräger centralna jedinica s 14 istoimenih monitora zamijenjena Philipsovom centralnom jedinicom (slika 4) i sa 7 MP20 monitora za koronarnu jedinicu (slika 5) i 7 MP2 monitora (slika 6) za postkoronarnu jedinicu, kojima

In 2011, the Dräger central unit with 14 monitors was replaced with a Philips central unit (Figure 4) with 7 MP20 monitors for the coronary unit (Figure 5) and 7 MP2 monitors (Figure 6) for the postcoronary unit, which allowed the unit to connect with



FIGURE 4. Central unit.



FIGURE 5. Patient monitor MP20.



FIGURE 6. Patient monitor MP2.

je dobivena mogućnost povezivanja s kardiološkim laboratorijem i snimanja holtera EKG-a bolesnicima smještenima u koronarnoj/postkoronarnoj jedinici. Time su omogućeni brže provođenje dijagnostike i određivanje adekvatne terapije, a samim time skraćeno je i trajanje boravka bolesnika u bolnici.

Kao što je uočljivo iz podataka prikazanih u **tablici 1**, u posljednjih nekoliko godina znatno je povećan broj bolesnika obrađenih u Koronarnoj jedinici (koronarna/postkoronarna skrb) OB Bjelovar, pri čemu se ukupan broj bolesnika kreće od 300 do 400 godišnje, a prosječno trajanje ležanja po bolesniku u Koronarnoj jedinici jest oko 5,5 dana.

the cardiological laboratory and conduct Holter ECG monitoring for patients in the coronary/postcoronary unit. This allows faster diagnostics and adequate treatment selection, thus reducing patient hospitalization time.

As can be seen from data shown in **Table 1**, over the last few years there has been a significant increase in the number of patients treated in the Bjelovar GH CCU (coronary/postcoronary care), with the total number of patients ranging from 300 to 400 per year and an average hospitalization time at the CCU of 5.5 days per patient.

TABLE 1. Number of treated patients in Coronary Care Unit at the Department of Internal Medicine of Bjelovar General Hospital in 2010-2018.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Coronary Care Unit	125	107	119	147	159	167	140	170	161
Postcoronary Unit	174	145	166	180	218	227	194	190	241
TOTAL	299	252	285	325	377	394	334	360	402

Kontinuiranim praćenjem bolesnika upućenih na invazivne zahvate u KBC Zagreb, KB Merkur, Specijalnu bolnicu Magdalena i KB Dubrava u razdoblju od 2010. do 2018. godine uočen je relativno stabilan broj upućenih bolesnika, u prosjeku oko 200 bolesnika godišnje (**slika 7**).

Invazivni postupci koji se provode u Koronarnoj jedinici jesu: postavljanje centralnoga venskog katetera (terapijskog i dijaliznog), privremenog intravenskog elektrostimulatora, elektrokardioverzija i transezofagijski ultrazvuk srca. Svim je hospitaliziranim bolesnicima dostupna sva potrebna medikamentna terapija (antiishemijski, antiagregacijski i antikoagulantni lijekovi, nefrakcionirani i niskomolekulski heparini i dr.).

Continuous monitoring of patients referred for invasive procedures to the UHC Zagreb, the University Hospital "Merkur", the Special Hospital Magdalena, and the University Hospital Dubrava from 2010 to 2018 showed a relatively stable number of referred patients, with an average of about 200 patients per year (**Figure 7**).

Invasive procedures conducted at the CCU are as follows: central venous catheter implantation (both for treatment and dialysis), temporary intravenous pacemaker implantation, electrocardioversion, and transesophageal echocardiography. Hospitalized patients are provided with all necessary medication treatment (anti-ischemic, anti-aggregation, and

