Проблемы здоровья и экологии/Health and Ecology Issues 2021;18(4):17–25

УДК 616-039.74:001.895
https://doi.org/10.51523/2708-6011.2021-18-4-2

Innovations in primary health care

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ABSTRACT

This review is devoted to a number of important innovations and their role in modern medical practice of a family practitioner. We have discussed benefits, restrictions and controversies related to their use. We have also reviewed the evidence base on the practical implementation of these innovations.

Keywords: *primary health care, general practice, innovations, point-of-care testing, remote consulting, e-learning.*
Author contributions. Platoshkin E.N.: idea generation, checking content, editing, approval of the article for publication; Platoshkina Yu.M., Shut S.A., Ramanov H.N., Kavalchuk A.N., Tishkov S.P., Bartnouski P.I., Seifidinova S.H.: collection of material, discussing data, reviewing publications on the article topic.
Conflict of interests. The authors declare no conflict of interests.
Funding. The study was conducted without sponsorship.
For citation: Platoshkin EN, Platoshkina YuM, Shut SA, Ramanov HN, Kavalchuk AN, Tishkov SP, Bartnouski PI, Seifidinova SH. Innovations in primary health care. *Health and Ecology Issues*. 2021;18(4):17–25. (In Russ.). DOI: https://doi.org/10.51523/2708-6011.2021-18-4-2

Инновации в первичной медико-санитарной помощи

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РЕЗЮМЕ

В данном обзоре рассматривается ряд важных инноваций и их место в современной практике семейного врача. Нами обсуждаются преимущества, ограничения и противоречия, связанные с их применением. Также нами анализируется доказательная база по практическому внедрению этих инноваций.

Ключевые слова*: первичное звено здравоохранения, общая практика, инновации, экспресс-диагностика, удаленное консультирование, электронное обучение.*
Вклад авторов. Платошкин Э.Н.: генерация идеи, проверка содержания, редактирование, утверждение рукописи к публикации; Платошкина Ю.М., Шут С.А., Романов Г.Н., Ковальчук А.Н., Тишков С.П., Бортновский П.И., Сейфидинова С.Г.: сбор материала, обсуждение данных, обзор публикаций по теме статьи.
Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.
Источники финансирования. Исследование проведено без спонсорской поддержки.
Для цитирования: Платошкин ЭН, Платошкина ЮМ, Шут СА, Романов ГН, Ковальчук АН, Тишков СП, Бортновский ПИ, Сейфидинова СГ. Инновации в первичной медико-санитарной помощи. *Проблемы здоровья и экологии*. 2021;18(4):17–25. DOI: https://doi.org/10.51523/2708-6011.2021-18-4-2

Introduction

Primary care has undergone significant transformation over the recent years. It was accelerated by the COVID-19 pandemic as general practices faced new unprecedented challenges. Innovations include new point-of-care testing and instrumental technology to aid quick decision making and promote primary prevention; new software tools and applications for general practitioners (GPs), doctors in training and patients; new roles within primary care teams to support GPs and expand service to a wider population.

Point-of-care testing

Laboratory testing traditionally forms an integral part of a diagnostic workup process. Centralized laboratories provide tests that follow a vigorous process of quality assurance and standardization – hence their higher reliability. On the other hand, this benefit comes at the expense of longer diagnostic turn-around time. In certain clinical scenarios, testing with rapid delivery of results may significantly affect clinical management plans, referral process (by preventing unnecessary referrals to secondary care or by supporting higher priority ones) and ultimately – patient outcomes. That is when testing with easy-to-use analyzers performed at the point of care and with results available within minutes – known as point-of-care testing (POC or POCT) or near-patient testing – becomes invaluable [1].

There is a variety of point-of-care tests available in primary care nowadays. Some of them are already widely used in clinical practice, for instance, urine dipstick tests, capillary blood glucose measurement, urine pregnancy tests, the International Normalized Ratio (INR) POCT, etc. While others are still uncommon, for example: quantitative C-reactive protein POCT, D-dimer POCT, Troponin T POCT, heart-type fatty acid-binding protein (H-FABP) POCT; B-type natriuretic peptide (BNP) POCT, 3-in-1 (Troponin T, BNP, D-dimer) POCT, etc.

The use of POCT in primary care setting is not limited to urgent presentations, but can also be used to deliver primary prevention. For instance, a recent review by El-Osta et al [2] evaluated near-patient testing of total cholesterol and blood glucose/HbA1c as a part of the Health Check program in England, which is focused on primary cardiovascular disease prevention in people aged 40–74 years. The authors performed a cost-minimization analysis and concluded that point-of-care testing in general practice for this purpose is likely to be cost-effective while supporting an increase in coverage. It could also be more convenient for patients and offers GPs the ability to complete Health Check in a single sitting.

Early systematic reviews of near-patient testing in primary care, for instance, the one done by Hobbs et al, date back to 1990-s [3]. For some point-of care tests, for instance, CRP POCT in respiratory tract infections, there is accumulating evidence of both clinical value and cost-effectiveness in primary care [4]. While for a number of other near patient tests evidence to support their use is limited [5] and further research is awaited.

Cost-effectiveness is an important limitation to the widespread use of point-of-care testing systems in general practice. A lot depends on the model of primary care in particular country. Healthcare systems which rely on small practices often make purchase of an expensive analyzer by a single practice a poor value for money due to a low volume of performed tests. While healthcare systems in which primary care is merged into super practices or polyclinics it is more likely to economically benefit from near-patient-testing systems.

Use of ultrasound by general practitioners

The extent of ultrasound use in GP surgeries varies from country to country. In Norway, 23% of out-of-hours primary care casualty clinics had access to ultrasound in 2015 with only tiny 14.1 ultrasound examinations being performed per 10,000 consultations [6]. In 2014, ultrasound was commonly used in primary care in Germany and Greenland, while less so in Sweden, Denmark, Austria, and Catalonia [7]. In some European countries, the use of ultrasound forms a part of undergraduate medical education or is available as formalized training for GPs [8]. Recent technological advances, for instance pocket ultrasound devices, represent a cheaper alternative to conventional ultrasound machines and have a potential for wider use by GPs.

A number of studies have assessed the ultrasound use by primary care physicians. For instance, a Spanish study assessed the use of pocket echocardiography by GPs in 393 patients with arterial hypertension with results re-assessed by a cardiologist and further digitally analyzed [9]. Good or very good concordance was demonstrated in the assessment of left ventricular and left atrial dimensions, ascending aorta, interventricular septum thickness, aortic and mitral valve regurgitation, aortic valve sclerosis, mitral valve calcification.

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A Norwegian study investigated the use of portable ultrasound by GPs to assess left ventricular function with septal mitral annular excursion following a tailored training course [10]. Following the comparison of the results from the GP-operated portable ultrasound scanner and cardiologist`s laptop scanner the study concluded that "it is possible for GPs, after a limited period of focused training, to use a portable ultrasound scanner to assess a surrogate marker for global left ventricular function in 87% of patients with or at risk of developing reduced left ventricular function".

Several studies assessed the possibility of abdominal aortic aneurysm screening by GPs trained to use the point-of-care ultrasound technology and had favorable results [11,12,13].

A Danish study assessed the following ultrasound findings done by GPs: gallstones, ascites, abdominal aorta >5 cm diameter, intrauterine pregnancy, gestational age and compared it to findings done by radiologists in hospital setting. Prior to that all GPs participating in the study underwent an ultrasound course that included e-learning modules, hands-on ultrasounds sessions and feedback from specialists. The study demonstrated a very high level of inter-rater agreement [14].

An Italian study evaluated general practitioner-performed compression ultrasonography for the diagnosis of deep vein thrombosis of the leg. It reported an excellent agreement between trained GPs and radiologists. A sensitivity of 90 % and a specificity of 97.1 % were achieved by primary care physicians [15].

A systematic review of ultrasound investigations performed by GPs in unselected populations concluded that "generalists can, given a certain level of pre-test probability, safely use point-of-care ultrasound in a wide range of clinical settings to aid diagnosis and better the care of their patients" [7].

A significant limitation to the use of ultrasound by GPs is the cost of ultrasound machines. Smaller portable devices whilst cheaper – have lower resolution and diagnostic accuracy. Lower volume of ultrasound examinations in smaller practices and additional training required for staff are further limiting factors. More studies are required to address the cost-effectiveness of portable ultrasound in primary care.

New instrumental technology

Technological progress and availability of applications for mobile devices brought both new opportunities and new challenges into general practice.

Rhythm analysis at the first point of contact with a GP for patients presenting with palpitations or in whom irregular pulse is an incidental finding during clinical examination is an important step towards faster anticoagulation in atrial fibrillation. For every 25 people diagnosed with atrial fibrillation and appropriately treated with anticoagulation, one stroke is prevented – hence the interest in technology allowing for a rapid rhythm analysis. Commercial devices are available that come as a pair of 2 electrodes and require just application of patient's fingertips for several seconds to be able to produce a 1-lead ECG recording that is transferred to mobile phone via a specialized software. The effectiveness of these devices is being evaluated in various settings, including general practice, older persons community teams, hospital outpatient clinics, community podiatry, mental health teams, pharmacies, etc. [16].

Widespread use of heart rate, rhythm and oxygen saturation sensors in mobile devices for general public use has resulted in an increased number of consultations done by GPs to address abnormal results. A variety of wearable devices, like fitness trackers and smart watches, allow to sense irregular pulse and notify the wearer of detected abnormalities. A number of studies (with some being sponsored by manufactures) addressed reliability of information they obtain [17, 18, 19]. And although the results of these studies are promising, certain concerns have been raised, including anxiety, unnecessary investigations, visits and health costs associated with false positive results; lack of proper certification for certain free apps, etc. [20]. There is also need to develop guidelines and frameworks to support GPs in obtaining, uploading to medical records and interpreting data recorded with wearable devices.

The COVID-19 pandemic has seen a rise in the use of oxygen saturation sensors on smartphones by members of the public. Indeed, these seemed to offer a useful tool to inform decisions of remote consultations done by GPs. However, a review of data performed by the Oxford COVID-19 Evidence Service Team demonstrated lack of evidence that current smartphone technology is accurate for the clinical measurement of oxygen saturation, and it was suggested that it should not be trusted for clinical purposes [21].

New consultation styles and software for primary care

The pandemic has changed the consultation landscape in primary care with a greater

use of telephone consulting, instant messaging as well as consulting via a video-link or via "e-consultation" technology.

Telephone consultations are a more traditional way of remote consulting. Since its invention in the 19th century, telephone has been used as a tool for healthcare provision. In fact, Alexander Bell's first recorded call was related to a medical problem – it was a request for his assistant to come after he had spilt sulphuric acid on himself [22]. And whilst the telephone technology is no longer an innovation per se, its widespread use for remote consulting adopted in recent years has entirely changed the way general practice is functioning. Nowadays the equipment (both mobile and landline phones) required to perform these consultations is readily available and no additional investment is needed for its wider implementation. In terms of history taking telephone consultations are able to provide a clinician with the same information as face-to-face consultations. But when it comes to examination, the limitations are becoming more obvious. Clinicians have to rely upon subjective assessment of patient's appearance, anatomical location of the problem, description of functional changes, etc. and therefore these consultations often end up being switched to a video link (if possible) or a face-to-face review. The quality of landline connection or mobile coverage is the other interfering factor that might affect the effectiveness of a telephone consultation.

Instant app to SMS messaging is a further option built up on a success of the mobile telephone technology in healthcare. It allows quick transfer of files (like sick notes, images of skin conditions, messages) between the mobile phones of patients and healthcare professionals and is available as a build-in option in certain remote consultation apps, for instance "AccuRx". Importantly these files can be transferred directly to the patient's electronic medical record via a link sent in SMS without the need to install any application on the patient's mobile phone.

With the start of the COVID-19 pandemic significant efforts were made to support healthcare professionals with tools that would allow safe and effective remote consultations via a video link or e-consultation. A number of software products ("*eConsult*", "*Navek Connect*", "*AccuRx*", etc.) are currently being used for that purpose. Video consultations significantly expand the amount of information that can be acquired during remote consulting. The technology has the potential to allow remote examination to evaluate patient's overall appearance, position, skin colour, distribution and characteristics of rashes, use of accessory muscles of respiration, establish the exact location of the painful area, check the range of movements in the joints, assess non-verbal cues, etc. It helps to establish eye to eye contact and often a better rapport between the patient and the healthcare professional.

Certain applications also allow to run remote multidisciplinary team meetings securely or host educational events.

The transformation of healthcare services from the traditional model relying on face-to-face consultations into a virtual environment based on remote consulting is an ongoing process. For instance, the National Health Service in England has set up ambitious plans to give every patient the right to online GP consultations over the next five years [23]. There were mixed responses to these changes from both patients and their GPs [24]. On one hand, there is a great optimism about the use of remote consulting in primary care. These consultations are seen as a way of reducing pressures on GP services (especially for simple queries that can be dealt with through an electronic environment without the need to arrange a formal consultation), widening opportunities for access to healthcare services (including for people living in geographically remote areas, those who are housebound or self-isolating), reducing time off work for attending GP appointments. They also help to reduce face-to-face contacts, which is especially important during the pandemic. On the other hand, virtual consultations represent a certain U-turn from the traditional face-to-face approach to consulting and as such they require a new set of skills from GPs to allow effective remote consulting of patients. There are concerns about the availability of new services to people who do not have access to modern technology or are less capable to use it. Modern software is reliant on a good internet connection and availability of smartphones and/or computers in population. Patients who do not have access to these devices or internet, which often is the case in elderly population, may not feel the full benefit from this technology. There are debates about the cost-effectiveness and safety of remote consulting. Also, additional financial resources are required to integrate and maintain new technologies. For instance, buying equipment, establishing fast internet connections, setting up secure servers to store sensitive data, providing IT support, staff training, etc. There is also a high demand in high-quality research to guide the change.

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Software and information resources for patients

Health information is becoming more accessible to the general public. The nickname "Dr. Google" reflects the emerging role of internet search engines in the process of satisfying the needs for this kind of data. Two-thirds of all patients search the internet prior to a health consultation. Existing evidence suggests that around 40% of patients rarely or never visit a doctor after searching for their symptoms online [25]. In the growing universe of health-related websites, applications, forums it is becoming more and more important that patients get access to the trusted high-quality information written by healthcare professionals in layman's terms. Acknowledging that fact many countries started to create large web-based health information platforms. For instance, in the UK, the National Health Service created "*nhs.uk*" website. This resource provides a large body of health-related information for patients and as of 2021 it was the UK's biggest health website, with more than 50 million visits every month [26]. The UK National Health Service is planning further investment in the "*nhs.uk*" website which they call their digital 'front door' [23].

As digital literacy, mobile phones and apps are transforming our everyday life – the UK National Health Service has gone an extra mile towards high-tech healthcare by creating an "*NHS app*". After downloading the app and proving their identity patients can securely connect to information from their GP surgery. "*NHS app*" wider integration with primary care software allows patients to order repeat prescriptions, book and cancel appointments, securely access their medical record, register organ donation decisions, consult a primary care specialist online, etc [27]. It also provides access to health information about a large number of medical conditions.

An interesting recent study by Gilbert et al. compared the accuracy of suggested conditions and appropriateness of advice given by eight different health apps vs that done by primary care physicians [28]. While none of the apps outperformed general practitioners – some came quite close further demonstrating the promising future of digital health services.

According to the data from the National Statistical portal of the Republic of Belarus, the proportion of population from 6 to 72 years of age having access to the internet rose from 58.4 % in 2013 to 82.8 % in 2019 [29]. That means that our healthcare system and information services have to be prepared to meet the growing demand of the Belarusian population for high quality health-related information.

New education tools for GP trainees

GP training across the world is constantly evolving. There were a lot of changes and flexibility in the way the educational process was arranged during the COVID-19 pandemic.

A large number of educational activities were shifted online. For instance, traditional formal group sessions for GP trainees in the UK became substituted by meetings via applications like *"Zoom", "Webex", "Microsoft teams".*

There was a significant rise in e-learning opportunities as well with a multiplication of e-learning modules, webinars, remotely run educational courses. One of the examples of popular e-learning platforms is Health Education England *"E-learning for healthcare"* [30]. A systematic review of the effectiveness of medical videoconference-based tele-education suggests that videoconference is «at least equivalent» to face-to-face education [31].

In some countries there was a dramatic change in the delivery of exit exams for GP trainees. For instance, the UK Royal College of General Practitioners Clinical Skills Assessment exam that included different stations with actors simulating clinical scenarios was substituted with the Recorded Consultation Assessment, which involves recording real life consultations and remotely submitting them for assessment [32]. Special online platforms like *"iConnect"* and *"14fish"* are being used for secure recording and storage of consultations.

New healthcare roles in primary care teams

Primary health care deals with significant amount of workload in various healthcare systems. For instance, around 90% of all National Health Service contacts in the United Kingdom occur in primary care [33]. And whilst demand continues to rise – in some countries new staff roles start to emerge. The general idea is delegation of tasks traditionally undertaken by GPs to new members within the team, enabling doctors to concentrate on more complex cases. For instance, in the United Kingdom in addition to clinical pharmacists and advanced nurse practitioners who have been a part of primary care teams for a while, new roles (physician associates, social prescribers) have been introduced.

Physician associates usually already have a first degree in biomedical or life sciences, and then undergo a 2-year postgraduate training course that includes clinical rotations both

in community and in hospitals. Physician associates can run their own clinics seeing less complex cases, do home visits, review results of investigations, but their work should be supervised [34].

Social prescribers help healthcare professionals to "link" patients with non-clinical services in the community to improve their health, wellbeing, and social welfare. They provide invaluable support to the most vulnerable patients with issues that may involve housing, finances, immigration, language, culture, food supply and social isolation [35]. They continue to play exceptional role during the COVID19 pandemic.

The role of General Practice Assistant was initially developed in the United States and Western Europe and is now being introduced in other countries. Their aim is to safely deliver a combination of routine administrative tasks and some basic clinical duties in primary care. They help GPs to reduce administrative burden and support vulnerable patients and regular attenders [36].

Conclusion

New technologies and challenges continue to shape modern primary care. There is a constant demand for high quality research to drive this change. More than twenty years of primary care system development in Belarus was based on the principles of general (family) medicine. Ongoing introduction of the most cost-effective innovations into medical practice and investment into research can help to further expand the potential of our primary care.

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Received / Поступила в редакцию 09.07.2021
Revised / Поступила после рецензирования 12.11.2021
Accepted / Принята к публикации 29.12.2021