

# Organizational, Technical and Economic Aspects of Implementation of Mammographic Screening in Ukraine

Y. KOVALENKO

*National Medical Academy of Postgraduate Education named after P.L.Shupika, Kiev*

**Abstract** —. The paper deals with the organizational, technical and economic aspects of the implementation of mammographic screening in Ukraine. It is shown that the introduction of preventive mammography is possible only with the digital technologies of the mammograms imaging, which can reduce the cost of operation of the mammographic room, reduce the number of required medical personnel for the screening and the radiation load on the women. However, realization of the benefits of digital mammography is only possible if the correct mammograms are displaying on specialized 5-MP monitors.

**Index Term** —.breast cancer, mammographic screening, digital mammography, the radiation load, the cost of operation of mammographic rooms

Like all over the world, the incidence of breast cancer is increasing in Ukraine - an average of 1-2% per year - and now in the structure of cancer pathology women breast cancer occupies one of the first places. Every 30 minutes in the country a new case of breast cancer is revealed. The incidence of breast cancer in Ukraine exceeds the level of 61 deaths per thousand women and now is the highest of all the nosology of cancer pathology [1].

Every second case of this disease is fatal [2]. Every year in Ukraine about 8.0 thousand women die from breast cancer, with one in ten of them - within a year from the date of diagnosis. One of the reasons of this is that more than 20% of cases are detected only in the 3rd and 4th stages of the disease.

One of the effective ways of struggle with cancer in Ukraine could be the introduction of mammography screening. The experience of many countries shows that the detection of breast cancer at an early stage can not only reduce mortality by 15-30% [3,4], but also avoid disability of women after surgery. Nationally, this means that every year more than 2.0 thousand of our women would be saved from the death. And how many will avoid mastectomy and preserve the natural beauty and health! Therefore, early diagnosis of breast cancer should be one of the priorities of the national health care.

For early detection of breast tumors the screening mammography is used abroad that women held annually after 45 years [3-5]. Until now, there was no sense to talk about the implementation of such surveys in Ukraine because of their high cost: for a film mammography only supplies are necessary for an amount exceeding \$ 6.0. Since Ukraine is home to over 10.0 million women over 45 years, using traditional film technology implementation of preventive mammography would require about 70.0 million dollars for the purchase of 1000.0 mammography systems and subsequent annual costs of film and chemicals in excess of 60.0 million dollars. And that does not include the cost of training of at least 2,000 radiologists and roentgenographers conducting mammography screening, their remuneration, as well as

service of equipment. Obviously, for such expenses Ukraine remains unrealistic.

Now with the introduction into clinical practice of digital X-ray technology and the emergence of the first experience of teleradiology introduction of mammographic screening in Ukraine becomes real. There are currently available full-field digital mammography, technical characteristics are not worth to foreign analogues. Conducted in 2006 at the Institute of Oncology Academy of Medical Sciences of Ukraine clinical trials of one of these mammography system have shown that it can be used for mammography screening for early detection of breast cancer. The transition to digital imaging technology X-ray imaging in mammography can reduce up to 40 times the cost of supplies, and significantly reduce the time of examination by the fact that the diagnostic image is ready for analysis within 10-20 sec. after exposure. In addition, one center of X-ray analysis in this case can process diagnostic information received from 3-4 mammography systems, which allows 3-4 times to reduce the number of doctors who have to learn how to analyze mammograms. In this case, the annual cost of preventive mammography will not exceed three million dollars including the cost of equipment maintenance.

However, even the training of 700 specialists to analyze the mammograms is complex and costly task in Ukraine. Therefore, one of the promising areas of digital mammography development is the introduction into clinical practice of CAD-systems (Computer Aided Detection), which are expected, will effectively detect pathology of breast cancer [8-12]. This will give the opportunity to refuse double reading of the mammograms and, therefore, still approximately halve decrease the number of staff required for the implementation of mammographic screening.

Recent studies have proven that computer-aided detection algorithms are capable of revealing breast lesions on screening mammography and of reducing the number of false-negative mammographic findings [8-11]. Studies typically report the sensitivity of commercially available devices and novel algorithms for microcalcifications and breast masses separately. The

sensitivity of CAD systems for the detection of malignant microcalcifications has been reported to be as high as 99% [10], whereas the sensitivity of the systems for the detection of malignant breast masses has been reported to be 75–89% [10,12] in large series.

Digital mammography allows not only to reduce the cost of the procedure, but also to improve the efficiency of women mammography and radiation safety compared to conventional mammography. Conducted abroad study on phantoms and in vivo studies have shown that the detection of microcalcifications using digital technology, the sensitivity and specificity in more than 2 times higher than for conventional systems "screen-film" [6,7].

Another significant advantage of digital mammography is the ability to explode in space and time processes of receiving and analysis of diagnostic imaging. This reduces the number of required for the screening of medical personnel and thus reduce the costs of operation of mammography rooms.

However, to fully exploit the benefits of digital mammography it is necessary to maintain a consistent view at the highest resolution possible on the medical displays used to interpret mammograms. There is a set of standards that should be followed for soft-copy displays. It is strongly recommended that at least 5-MP monitors are used. There are also recommendations regarding monitor luminance, contrast, and lookup tables. The displays should have the ability to support zooming and panning and to view images in full resolution. Generally viewed on 5-MP monitors, digital mammography requires the highest resolution among the routinely used imaging modalities, resulting in better visibility of subtle masses and calcifications.

The using for analysis of digital mammograms conventional monitors leads to discredit the technology of digital mammograms.

Thus, the transition to digital mammography can not only effectively reduce the cost on the order of one study, but also increase the effectiveness of mammography examinations for women and their radiation safety.

Thanks to digital X-ray imaging technologies introduction into clinical practice of mammographic screening became more real and the opportunity to save the lives and health of our women appears! It depend on the government if we use this opportunity.

#### REFERENCES

[1] Показники здоров'я населення та використання ресурсів охорони здоров'я в Україні за 2008-2009 роки: довідник. – Київ,2010. – 330 с.

- [2] Онкологічні захворювання в Україні 1993-2003 рр.: довідник. – К.,2004. – 28с.
- [3] Haus A.G., Yaffe M.J. Syllabus: A Categorical Course in Physics. Technical Aspects of Breast Imaging. – RSNA, 1994. – 308 p.
- [4] Бурдина Л.М., Маковкин Д.В. Методы и средства современной рентгенодиагностики заболеваний молочной железы. – М.: Фирма СТРОМ, 2003. – 184 с.
- [5] Bjurstam N, Bjorneld I., Mammography screening in women aged 40-49 years at entry: results of the randomized, controlled trial in Gothenburg, Sweden. Syllabus, 26th National Conference on Breast Cancer. Reston Va: American College of Radiology.- 1994.-101 p.
- [6] Миронова Ю., Коваленко Ю. Мамографія в Україні: сьогодні та майбутнє// Радіологічний вісник,2006. - №3.- с.21-23.
- [7] Fischer U, Baum F, Obenauer S, Luftner-Nagel S, von Heyden D, Vosshenrich R, Grabbe E (2002) Comparative study in patients with microcalcifications: full-field mammography vs. screen-film mamography.- Eur Radiology, No12,2002. - pp.2679-2683.
- [8] Birdwell R, Ikeda D, O'Shaughnessy K, Sickles E. Mammographic characteristics of 115 missed cancers later detected with screening mammography and the potential utility of computer-aided detection. – Radiology 2001; 219. – pp. 192 –202.
- [9] Freer T, Ulissey M. Screening mammography with computer-aided detection: prospective study of 12,860 patients in a community breast center. – Radiology 2001; 220. – pp. 781 –786.
- [10] Burhenne LW, Wood S, D'Orsi C, et al. Potential contribution of computer-aided detection to the sensitivity of screening mammography. – Radiology 2000; 215. – pp. 554 –562.
- [11] Evans WP, Burhenne LJ, Laurie L, O'Shaughnessy K, Castellino R. Invasive lobular carcinoma of the breast: mammographic characteristics and computer-aided detection. – Radiology 2002; 225. – pp. 182 – 189.
- [12] Petrick N, Sahiner B, Chan H, Helvie M, Paquerault S, Hadjiiski L. Breast cancer detection: evaluation of a mass-detection algorithm for computer-aided diagnosis: experience in 263 patients. – Radiology 2002; 224. – pp. 217 –224