

Breast Imaging Reporting and Data System (BI RADS) – why don't we use it correctly in the region?

Nataša Prvulović Bunović^{1,2}, Milica Mastilović², Maja Stankov^{2,3}, Borislava Nikolin^{2,4}

SUMMARY

Breast Imaging Reporting and Data System (BI RADS) is used for the standardization of radiological reports in breast imaging, created by the American college of radiology (ACR). Standardized reports allow breast lesion characterization, malignancy risk assessment, and facilitate communication between doctors. The system is made for everyday clinical practice with the aim of improving the quality of diagnostics and anticipate the comparisons of results with colleagues from other health institutions, while in Serbia to assist in communication with colleagues from the region. The BI RADS system is composed of lexicon recommendations for structured radiological reporting and further management. Most health institutions in Serbia and surrounding countries use it, but in everyday clinical practice the system is not correctly implemented in all institutions. During daily imaging procedures we see radiological reports coming from different institutions in the region. Some of them clearly show that the system is misunderstood and not implemented correctly. Our aim is to evaluate the use of the BI RADS system in everyday clinical practice in Serbia and the region, to explain why it is not used correctly, and to point out the most common mistakes with the desire to make the system work adequately.

Keywords: BI RADS, mammography, breast imaging

BREAST IMAGING REPORTING AND DATA SYSTEM

In order to standardize radiological reports, the Breast Imaging Reporting and Data System (BI RADS) was created and published by the American College of Radiology (ACR) (1). The system is a product of cooperation between numerous health associations, research centers and individuals. In fact, through standardized radiological reports the communication between physicians is facilitated, allowing the characterization of breast lesions and assessing the risk of malignancy. The system is made for everyday practice with the aim of improving the quality of our performance and to make our results equivalent to the results of our colleagues from other hospitals. In everyday clinical practice in Serbia and surrounding countries with the same/similar language, we all meet with breast imaging radiological reports, and it is important that we all use the system correctly in order to adequately treat our patients. Moreover, the system provides quality assurance, facilitates research and communication between physicians, thus raising the quality of patient care.

Over time, the BI RADS system has evolved (2). After the initial development in 1993, four revisions were made and published in 1995, 1998, 2003 and 2013 (1). It has been announced that a new revision will be published in 2024. The first edition of the BI RADS system was released in 1995 aiming to standardize mammographic findings reports, while the last edition, published in 2013, introduced both ultrasound and MR mammographic standardized reporting.

In addition to the fact that the system is subject to criticism, in a paper published in 1994 it was stated that “the key is the quality of the mammography report and not the terminology” (3). Today, after five revisions, almost all developed countries accepted this system, and radiologists recognize this system of reports stan-

dardization as a great modality for daily practice, recommendations and further management (4).

BI RADS is called a system because it contains several components, of which the most important are: lexicon, recommendations for structured radiological reporting (with definitive grading categories that are expressed numerically, 0-6), and the accompanying recommendations for further procedures (Table 1). It is a framework for data collection and their audit.

Table 1. Final Assessment Categories and risk of malignancy (<https://radiologyassistant.nl>).

Category	Management	Likelihood of cancer
0 Need additional imaging or prior examinations	Recall for additional imaging and/or await prior examinations	n/a
1 Negative	Routine screening	Essentially 0%
2 Benign	Routine screening	Essentially 0%
3 Probably Benign	Short interval-follow-up (6 month) or continued	>0 % but ≤ 2%
4 Suspicious	Tissue diagnosis	4a. low suspicion for malignancy (>2% to ≤ 10%)
		4b. moderate suspicion for malignancy (>10% to 50%)
		4c. high suspicion for malignancy (>50% to <95%)
5 Highly suggestive of malignancy	Tissue diagnosis	≥ 95%
6 Known biopsy-proven	Surgical excision when clinical appropriate	n/a

Arch Oncol 2024;30(2):9-14

<https://doi.org/10.2298/AO0240606008P>

1 Center for Imaging Diagnostics, Oncology Institute of Vojvodina, Sremska Kamenica, Serbia

2 Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia

3 Radiology Center, University Clinical Center of Vojvodina, Novi Sad, Serbia

4 Clinic for Internal Oncology, Oncology Institute of Vojvodina, Sremska Kamenica, Serbia

Correspondence to:

Milica Mastilović

email: 1408d20@mf.uns.ac.rs

Received: 2024-06-06

Received in revised form: 2024-08-02

Accepted: 2024-08-06

Published online: 2024-10-15

This system should be concise and structured in the following order: assessment of the overall breast composition or density; description of all significant observed lesions (precisely defined descriptive terminology) in terms of observed lesion morphology, its localization and size measurement; final assessment category using the numerical system 0-6 with further management recommendations (further diagnostics, regular controls, controls in a short period of time, or biopsy). BI RADS promotes the use of clear and standardized terms when interpreting mammograms and the radiologist must determine the assessment category.

BI RADS promotes the following structure of the mammographic report:

A. The report must be short, clear, and concise, and contain the following elements:

1. Provide an indication for examination: screening study, diagnostic study or follow-up with important data from the patient's medical history.
2. Characterize the mammographic composition of the breast: for each breast determine one of the four breast composition categories, taking into account the percentage of glandular tissue.
3. Clear description of any important findings/details on the mammogram using standardized terminology. It suggests morphological descriptions: shadow/mass, asymmetry, architectural distortion, and calcifications. Such changes may be associated with other findings, such as mass with skin thickening, retraction of the nipple, calcifications, etc. It also promotes the correlation of the findings with clinical information or other relevant data from previous imaging diagnostics.
4. Make a comparison with previous examinations/mammography, if available.
5. Final assessment category and further recommendations: the findings should be stated in a numerical BI RADS value (0-6) and associated with a precisely defined descriptive phrase. In case of multiple findings, the final BI RADS assessment category should be according to the highest numerical category. If an additional ultrasound examination is performed in the same act, the higher BI RADS assessment category is given.
6. Highlight the unexpected findings in the report to the clinical doctor - everything that is communicated to the patient should be recorded in the report.

B. Breast composition characterization - characterization of breast tissue structure:

Due to the standardized report, all breasts should be classified into one of four categories of breast composition, depending on the amount of glandular-density tissue, types from 1 to 4 (lipomatous, scattered glandular densities, heterogeneous dense breast, and

extreme dense breasts).

C. Standardized terminology used for describing findings:

1. Shadow (mass, lesion): shape (round/oval/irregular), margins (clear/unclear/microlobulated/irregular/spiculated); density (fat/low/equal to surrounding tissue/high).
2. Asymmetry: parenchymal distortion without clearly visible shadow.
3. Calcifications: morphology (typically benign and suspicious) and distribution (diffuse, regional, grouped, linear, segmental).
4. Associated findings: skin retraction, nipple retraction, skin thickening, trabecular thickening, axillary adenopathy, architectural disorder, calcifications.

D. Standardized terminology for the localization of the observed mass on the mammography examination:

When determining the localization of the observed mass on the mammogram, it is necessary to clearly indicate the side of the mammography (left or right breast); to locate the change according to quadrant affiliation and/or "clock position"; to determine the depth of the localized lesion, by dividing the breast corpus by 1/3 (anterior/medial/posterior) and to measure the distance of the mass from the nipple.

E. Standardized terminology for measuring the size of the observed masses on mammography:

When measuring mass, the longest and the shortest diameters using straight perpendicular lines to each other should always be measured. For spiculated shadows, the length of the spicules should not be measured. In case of architectural distortion or asymmetry, the approximated longest diameter should be measured. When measuring the calcification zone, the longest linear dimension should be approximated. A shorter axis for lymph nodes should always be measured.

As already mentioned, the ACR BI RADS lexicon was revised in 2013, and changes were introduced for the morphological description, categorization of observed lesions and further management of the patient. A difference was made for the description of diagnostic and screening mammography, as well as for the results of additional diagnostic procedures.

BI RADS was created to standardize the way of describing imaging findings using precisely defined terms, with the aim of facilitating communication among radiologists and clinicians and management of breast lesions. The first lexicon was published in 1993 for mammography reports to allow radiologists and clinicians to use universal terminology. One of the first criticisms of this system was the limitation only to the morphology and appearance of the lesion, rather than what they represent in terms of pathology. This drawback was overcome by introducing final assessment categories 0-6 and recommendations for further lesion management (follow-up or biopsy) making mammography reports "decision oriented" (5). It is important to

know that the BI RADS system helps doctors to communicate, predicts the risk of breast malignancy, and facilitates radiological monitoring of patients, without giving a definitive diagnosis. In Serbia, most health care institutions use this radiological system, but in everyday clinical practice, the BI RADS system is not adequately implemented in all institutions. Further education is needed for radiologists, surgeons and oncologists who rely on this system to indicate further imaging controls. ACR has announced a new revision of the BI RADS system during 2024 in order to eliminate doubts that emerged from the previous lesion classification, and to allow adequate treatment and follow-up of oncology patients (6).

The last 5th edition of the BI RADS system has its limits, thus the new 6th edition has been announced to be published this year and has a role to overcome some doubts and to propose new terminology, especially for ultrasonography and MR mammography. The new, revised BI RADS system will focus on establishing new terminology and improving previous recommendations. For example, in terms of MR mammography, categories 3 and 4 have to be determined in regard to ultrasonography and mammography. The criteria for the new diagnostic modalities (e.g., contrast mammography) have to be defined. New implemented parameters, such as molecular profile as a parameter for breast cancer staging and criteria for the follow up of neoadjuvant therapy (in terms of how to denote a complete radiological response to the applied therapy), would have to be adopted by the American Joint Committee on Cancer. A new system is necessary in order to define the diagnostics more clearly and precisely – therapy relations for the greater benefit of the patients (2,7).

BI RADS SYSTEM IN SERBIA

In our Institution the System has been used since 2007. Since then, it has been slowly accepted and implemented in other institutions across Serbia, and soon

after that, it was accepted in the rest of the countries of the region (Republic of Srpska, Federation of Bosnia and Herzegovina, Montenegro, and Macedonia). In our daily clinical practice, we see the radiological reports coming from institutions across the region. However, today, 15 years after the implementation of the system into our region, radiological reports which clearly show that the system is not understood adequately are quite often seen. In the following sections we will give a couple of examples of the BI RADS classification which we see in our daily clinical practice.

The most common mistake that is seen is that radiologists must be decision oriented. In example 1 (Picture 1), this type of mistake can clearly be seen in the first sentence: "On the left side, at the junction of the upper quadrants, in the area of 8mm, several clustered suspicious pleomorphic calcifications and a small 6mm stellate condensation of a parenchyma are seen." The radiologist who interpreted screening mammography relatively precisely described the pathological area in the sense of its morphology and microcalcifications, as well as the localization. BI RADS category 3 was given, which means that the described lesion is probably benign, and needs a further intensive follow-up of a patient. If the BI RADS system had been adequately used, based on its characteristics, the lesion would have been adequately classified as BI RADS category 5. This category suggests an infiltrative lesion and needs further histopathological verification and adequate treatment.

In the second example (Picture 2), by using the BI RADS system the radiologist relatively correctly describes complex cysts in both breasts, but again without clear localization of the lesions. BI RADS 3 bill was given and the radiologist gives the recommendation for further MR mammography, which was done later. According to the BI RADS rules, BI RADS 3 on sonography or mammography suggests a follow-up exam in a 6-month period rather than further imaging.

Nalaz i mišljenje

Mamografija obe dojke u CC i MLO projekciji-noviji UZ nalaz nema?

-pozitivna porodična anamneza

-komparacija sa MG nalazom od 13.08.2021.

Obostrano dojke tip ACR B.

Levo na spoju gornjih kvadranta na području veličine 8mm izdvaja se nekoliko grupisanih, susp. pleomorfnih kalcifikata i mala 6mm stelatna kondenzacija parenhima uz nju. Na prethodnoj mamografiji navedene promene su manje intenzivne.

Desno bez izdvajanja područja patološke kondenzacije parenhima. Kalcifikati benignih karakteristika.

Obuhvaćeni delovi aksila bez signifikantno uvećanih ly. nodusa.

BI RADS 3 sin.

BI RADS 2 dx.

-uputno bi bilo uraditi kontrolni UZ pregled i MR dojki

Picture 1. The example of mammographic report in which highly suspect lesion in the left breast is described. The conclusion is BI RADS 3, and the patient is sent to further diagnostics.

NALAZ RADIOLOGA:**EHOTOMOGRAFIJA OBJE DOJKE:**

Obje dojke heterogene gradje.

U LD u GSK dvije komplikovane ciste veličine 8mm, odnosno 7mm.

U DD na spoju donjih kvadranta komplikovana cista veličine do 6mm. Paraareolarno, spoj spoljašnjih kvadranta, prepektorarno jedna lobulirana ili dvije priljubljene hipohogene promjene ukupnog dijametra do 11mm, ddg. komplikovane ciste, manje vjerovatno solidne promjene

U aksilama se ne vide patološko uvećani LN.

BI RADS DD 3

BI RADS LD 3

Javiti se na Konzilijum za dojku u Centru za dojku radi razmatranja MRI dojki

ZAKLJUČAK:

Picture 2. Ultrasonographic report in which complicated cysts are described in breasts bilaterally. Further diagnostics is suggested.

MR mammography has relatively low specificity in the characterization of the inner structure of a cystic lesion, especially in small cysts, so it cannot solve the problem in this case.

In our next example (Picture 3), the radiological report BI RADS 3/4a was given for the left breast. This is a highly unspecified report that does not give any value and useful information. A significant fault of this report is omitting the conclusion. The clinician does not know if the patient must be treated or sent to further imaging, nor does he know if histopathological verification is necessary, or if the lesion can be followed.

In order to easily communicate, that is “speak the same language”, all doctors involved in the diagnosis and treatment of patients with breast cancer should use the BI RADS system. The description of lesions is not standardized, measurements of detected lesions are not applied, but clear and precise locations of the detected lesions in breasts are also not written. However, radiological and morphological terminology is relatively correctly used in our examples, but the final conclusion of every radiological report has to be numerical (BI RADS 0 to 6) with mandatory recommendations for further steps, which is not precisely or accurately

PREPORUKA:

Potrebno je načiniti i dodatnu dg. lijeve dojke (ekspertske UZ, MR) - konsultovati Konzilij DZ HN o daljnjoj dg. i postupanju.

DIJAGNOZE:**NALAZ RADIOLOGA:****UZ DOJKE:**

Dojke hiperehogene - fibroglandularne, fibrocistične, mjestimično naglašene stromalne fibroze, obostrano sa anehogenim cistama, najveće lijevo u GMK promjera oko 12 mm, desno u DLK promjera oko 16 mm.

U lijevoj dojci, GLK, te u desnoj dojci periferno, uz rub parenhima, prema aksili, vide se horizontalno orijentisane, ovalne, hipohogene promjene promjera oko 7 mm, a veća promjena sličnih UZ karakteristika vidi se u DLK lijeve dojke i promjera je oko 15 mm, dif.dg. FA?

U lijevoj dojci u GMK i ka spoju GK, vidi se horizontalno orijentisan, nepravilno ovalna, hipohogena zona, sačaste strukture, prožeta anehogenim i hipohogenim poljima, vidnog centralnog vaskularnog signala, promjera oko 15 mm, dif.dg. fibrocističan plak?

U aksilama se ne vidi suspektno patološki uvećanih limfnih nodusa.

BIRADS DD2 LD3/4a.

ZAKLJUČAK:

Picture 3. The example of a highly unspecified radiological report in which radiological grade BI RADS 3/4 was given.

Our next example (Picture 4) shows an unstandardized description of an ultrasonographically detected lesion. The report is missing a conclusion. We consider the indication for MR mammography unjustified, because the standard imaging method, mammography, is skipped in this case. The radiologists mentioned above in the 4 examples from Serbia and the region clearly show that the BI RADS system exists, but that radiologists are not very well familiarized with its significance and essence. The situations from our 4 examples are very characteristic and often seen in our clinical prac-

tice. In order to easily communicate, that is “speak the same language”, all doctors involved in the diagnosis and treatment of patients with breast cancer should use the BI RADS system. The description of lesions is not standardized, measurements of detected lesions are not applied, but clear and precise locations of the detected lesions in breasts are also not written. However, radiological and morphological terminology is relatively correctly used in our examples, but the final conclusion of every radiological report has to be numerical (BI RADS 0 to 6) with mandatory recommendations for further steps, which is not precisely or accurately

EHO DOJKI I AKSILA

Kontrolni pregled, a nakon antibiotske Th.
 Rranija dokumentacija u prilog.
 Subjektivno bez značajnijih tegoba, rutinska kontrola.
 Obiteljska anamneza u smislu maligniteta dojki pozitivna (dvije majcine sestre liječene od Ca dojki).
 Inspekcijom nalaz uredan, palpatorno dojke nodularne.
 Ehografski iznimno dobro ocuvano žljezdano tkivo, sa mastopatskim promjenama, mastopatskim plakovima koji stvaraju sliku defekta dorzalnog ehoa i duktektazijama koje su više izražene lijevo, sitne ciste promjera do 0,3 cm.
 Desno, na granici dva lat. kvadranta, subkutano, intramamarni limfonod promjera do 0,4 cm.
 Lijevo uz lat. rub areole a na desnom boku hipoehogena area, na arealu dječijeg dlana, i dalje perzistira, bez upalnog okolnog infiltrata.
 U aksilama postupalno izmjenjeni limfonodi.

Zaključak:

Area opisana lijevo, na granici dva lat kvadranta je otvorene etiologije.

Budući da se radi o iznimno žljezdanoj dojci, te u kontekstu obiteljske anamneze, radi bolje diferencijacije molim MRM.

Picture 4. Ultrasound examination report with the unstandardized terminology and missing the conclusion.

Razlog pregleda: skrining	Reason for exam: screening.
Porodična istorija za rak: negativna	Family history of cancer: negative
Prethodni mamogram: pre 2 godine (tačan datum i ustanova)	Last mammogram: performed 2 years ago (date and Institution)
Urađeni su 2D mamogrami obe dojke u CC i MLO projekciji:	Bilateral digital CC and MLO views were taken.
Dojke su većim aspektom fibrolipomatozne strukture, ACR tip 2.	The breast tissue is fibrolipomatous, type ACR 2.
Ne detektuju se suspektne senke i patološke mikrokalcifikacije.	No masses, calcifications or other abnormalities are seen.
Nema novonastalih promena komparirano sa prethodnim mamogramima.	No significant interval changes compared to previous mammograms.
U obuhvaćenom segmentu aksila ne uočavaju se uvećani limfonodusi.	
ZAKLJUČAK: Uredan nalaz, BI RADS 1.	CONCLUSION: Negative findings, BI-RADS category 1.
Skrining mamografija na 2 godine.	Screening mammogram in 2 years.

Picture 5. A well-written radiological report that follows BI RADS recommendations.

These observations of a radiologist with 2 decades of experience and adequate education in the breast imaging area, do not have as their aim the criticism of colleagues. However, they show the will to correct the observed oversights from everyday practices in order to have a better collaboration between doctors. All this will have an impact on the wellbeing of our patients, who sometimes go through unnecessary examinations, and unnecessary biopsies. And finally, the most important thing is that some of the patients stay undiagnosed, meaning that the breast cancer stays undetected, because a radiologist who examines them is not educated enough, does not ask for supervisory opinion in uncertain cases when they are not sure about the diagnosis, or does not send patients to a tertiary institution where they would

be adequately diagnosed and treated. The only solution for the above stated problems and raising the quality of our work is continuous education, following the contemporary trends in imaging and principles for breast pathology treatment. Equally important is that the diagnostics of patients should not be done with inadequate equipment (old, outdated equipment). To conclude, only with knowledge and quality equipment can we increase the reliability of our reports, improve communication in relation to radiologist-surgeon-oncologist, and in relation to this team with the rest of the doctors taking care of a patient, and all that with the aim of better diagnostics and treatment of breast cancer as the leading cause of mortality from malignant diseases in our region.

REFERENCES

1. American College of Radiology, D'Orsi CJ, Sickles EA, Mendelson EB, Morris EA, editors. ACR BI-RADS atlas: breast imaging reporting and data system ; mammography, ultrasound, magnetic resonance imaging, follow-up and outcome monitoring, data dictionary. 5th edition. Reston, Va.: ACR, American College of Radiology; 2013.
2. Eghtedari M, Chong A, Rakow-Penner R, Ojeda-Fournier H. Current Status and Future of BI-RADS in Multimodality Imaging, From the AJR Special Series on Radiology Reporting and Data Systems. *AJR Am J Roentgenol*. 2021 Apr 2;16(4):860–73.
3. Heilbrunn KS. The American College of Radiology's mammography lexicon: barking up the wrong tree? *AJR Am J Roentgenol*. 1994 Mar 1;62(3):593–4.
4. Spak DA, Plaxco JS, Santiago L, Dryden MJ, Dogan BE. BI-RADS® fifth edition: A summary of changes. *Diagn Interv Imaging*. 2017 Mar 9;8(3):179–90. doi: [10.1016/j.diii.2017.01.001](https://doi.org/10.1016/j.diii.2017.01.001).
5. Magny SJ, Shikhman R, Keppke AL. Breast Imaging Reporting and Data System. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
6. Kinkel K. The never-ending success story of BI-RADS. *Diagn Interv Imaging*. 2017 Mar 9;8(3):177–178. doi: [10.1016/j.diii.2017.02.003](https://doi.org/10.1016/j.diii.2017.02.003).
7. Granata V, De Muzio F, Cutolo C, Dell'Aversana F, Grassi F, Grassi R, et al. Structured Reporting in Radiological Settings: Pitfalls and Perspectives. *J Pers Med*. 2022 Aug 21;12(8):1344.