

## REPORT OF AN UPDATE TO THE PERSIAN TRANSLATION OF MEDICAL PHYSICS TERMS: EMITEL INTERNATIONAL DICTIONARY

Behrouz Rasuli<sup>1</sup>, Ali Mahmoud-Pashazadeh<sup>2</sup>, Azam Niroomand-Rad<sup>3</sup>, E. Ishmael Parsai<sup>4</sup>

<sup>1</sup> Department of Radiology Technology, Behbahan Faculty of Medical Sciences, Behbahan, Iran. <sup>2</sup> Persian Gulf Nuclear Medicine Research Center, Bushehr University of Medical Sciences, Bushehr, Iran. <sup>3</sup> Department of Radiation Medicine, Georgetown University Medical Center, Washington DC, USA. <sup>4</sup> Department of Radiation Oncology, University of Toledo Medical Center, Toledo, Ohio, USA.

**Abstract**— The aim of this paper is to introduce first update to the original online Persian translation of medical physics terms in the Multilingual Dictionary of Medical Physics Terms, available also at EMITEL (European Medical Imaging Technology e-Encyclopedia for Lifelong Learning), that is both accurate and common. Consistent with EMITEL objectives, periodic review of EMITEL terms is imperative to ensure the quality in the Persian language. This first update of Persian translation section of EMITEL, that provides significant improvements to the original one, is outcome of many hours of volunteering efforts by numerous contributors. In this report, we present a sample of revised words as searched in EMITEL based on the key words entered in its search engine, and present explanation of definition of the acronyms in English section of EMITEL. Attempts are made to review and revise all (4921) entries of EMITEL terms, whether a single word or combination of words, that are precise and frequently used by medical physicists in Iran. Revision of some sample words such as *Dose, Radiation, Image, Imaging, Radiotherapy, Ultrasound, Protection, MRI, Radiobiology, CT Scan, PET, Film and Detector* are also presented in this report.

### I. INTRODUCTION

With widespread use of online educational resources, some features of distant learning and educational technique have changed greatly in the past few years (1, 2). Online educational resources provide an easy-to-access complementary learning tools to students, teachers and educational organizations (3). One of these online tools is EMERALD (European Medical Radiation Learning Development) e-Learning material involving UK, Sweden, and Italy that was developed in late 1990's. Later on, in early 2000s EMERALD project was expanded and led to development of EMIT Multilingual Dictionary of Medical Physics Terms (International Dictionary). The latter was further expanded into EMITEL (European Medical Imaging Technology e-Encyclopedia for Lifelong Learning), including the respective translations of the International Dictionary (4). The International Dictionary was established to address the needs of medical physics professionals. It was initially founded in association with the European Federation of Medical Physics (EFOMP), then the project was joined by the International Organization of Medical Physics (IOMP) during the International World Congress of Medical Physics in Seoul, South Korea, in 2006 (4).

The International Dictionary first started with 7 languages (English, Swedish, Italian, French, German, Portuguese, and Spanish), and later 22 languages, including Persian, were added, thus forming the existing list of 29 languages (4). By mid-2000's the International Dictionary provided a foundation for the development of EMITEL e-Encyclopedia of Medical Physics with c.3200 terms (4). The full International Dictionary is now accessible from [www.emitdictionary.co.uk](http://www.emitdictionary.co.uk), while the terms included in the e-Encyclopedia of Medical Physics are accessible from [www.emitel2.eu](http://www.emitel2.eu) - both as terms translation in 29 languages and as encyclopedic entries in English for each term (5).

According to IOMP statistics, over 4600 users visited the [emitdictionary.co.uk](http://emitdictionary.co.uk) website of the EMITEL from April to January, 2013 and over 10174 users visited the [emitel2.eu](http://emitel2.eu) website (4). Over 200 translators, experts in medical physics and related fields including (but not limited to) radiation therapy, diagnostic radiology, nuclear medicine, ultrasound imaging, magnetic resonance imaging and radiation protection, were involved in this massive undertaking (4). In this current update of the Persian translation, the ultimate goal was to introduce accurate and proper substitutes for English terms that are meaningful, practical, and reflect and convey the equivalent in the Persian language. As this was the first complementary step to revise the Persian section of the International Dictionary, the authors of the current report, besides introducing this project to the Persian-speaking medical physics communities, present a brief overview of the effort which resulted in a revised and enriched Persian section of the Dictionary at both web sites.

### II. METHOD AND MATERIALS

The first version of Persian section of the International Dictionary was implemented in mid 2000s. This first version was the results of many hours volunteering efforts by Prof. Alireza Binesh, [Persian Coordinator], from Payam Nour University, Fariman, Iran, Dr. Ali Asghar Mowlavi, from Sabzevar Tarbiat Moallem University, Sabzevar, Iran, and Prof. Azam Niroomand-Rad, IOMP Past President from Georgetown University Medical Center, Washington DC, USA (4).

In this first update of Persian translation that started in late 2014 efforts were made to substitute some words, either as a single word or in combination with other words, that are “accurate” and in “common” use by current medical physicists in Iran. A comprehensive review of all (4921) EMITEL words was performed. After thorough examination, authors of this manuscript found that some Persian translations were not consistent or practical for Persian-speaking medical physicists. In addition, in some cases few extra words had to be added to make the Persian translation more clear and concise. Moreover, in some cases corrections were made to eliminate misconceptions of the exact meaning of the words that were incorrect.

Lastly, with the objective of enriching Persian translation of the Dictionary, attempts were made to identify over 45 acronym of abbreviated words in the English section of the International Dictionary that were described accordingly.

### III. RESULTS AND DISCUSSION

After careful examination of all (4921) entries of the Persian translation of terms, they were updated at the Dictionary web site: [www.emitdictionary.co.uk](http://www.emitdictionary.co.uk). (8)

Those of the terms (c.3200), used also in the EMITEL Encyclopedia, were also updated. Like any other online websites with e-learning materials, EMITEL International Dictionary was also updated in several languages and that update of Persian translation was a timely task.

Our criterion for update of Persian section of EMITEL dictionary was to suggest those Persian equivalent words for English terms that are more practical and more commonly used by medical physicists in Iran (6). In some cases, however, some words had to be replaced completely since there were some errors either in spelling or in concept. To ensure correct and precise Persian translation, where it was necessary, comments of experts were also included to provide the best translation for the English terms.

Table 1 compares our proposed translation of a few Persian words for update of Persian section of the International Dictionary that we believe are “common and correct” translations as compared with the existing ones. As shown in Table 1, some of the words such as “Build up dose”, “Dose tolerance”, “Time dose fractionation” and “Radiation biology” were translated word by word rather than as a whole phrase, which did not convey the true concept of the phrase. In a few words such as “Functional MRI”, “Radiation quality”, “Film crystals” and “lead protection” some errors in translations were seen and were corrected. At the writing of this paper, we expect our proposed update is uploaded in both websites [www.emitdictionary.co.uk](http://www.emitdictionary.co.uk); and EMITEL [www.emitel2.eu](http://www.emitel2.eu) and can easily be accessed by the readers.

Moreover, the Persian translation team of International Dictionary - both past and present contributors - have tried to find the most appropriate and commonly used Persian words that are equivalent to the English terms. However, there were some limitations for this task. The most obvious one was to translate the abbreviated English terms that are common in English language, but not in Persian language. Therefore, when these abbreviated terms were identified, their acronyms were spelled out with their corresponding Persian translation accordingly, such that they are meaningful to Persian speaking medical physicists in Iran and elsewhere.

Lastly, authors of this paper hope that with the combined efforts of our translation teams (past and present) we are able to provide comprehensive and precise translation of the Persian section of Multilingual International Dictionary and EMITEL that can enhance quality e-learning in Persian language and ultimately be useful for the education and training of medical physicists for all Persian speaking population of the world (7).

**Acknowledgements:** This work was supported by Behbahan Faculty of Medical Sciences (Project No. 9401)

### IV. REFERENCES

1. Wang Y, Sun C. Internet-based real time language education: Towards a fourth generation distance education. *Calico Journal*. 2013;18(3):539-61.
2. Zhao Y. Recent developments in technology and language learning: A literature review and metaanalysis. *CALICO journal*. 2013;21(1):7-27.
3. Rutten N, van Joolingen WR, van der Veen JT. The learning effects of computer simulations in science education. *Computers & Education*. 2012;58(1):136-53
4. S Tabakov VT, M Stoeva, A. Cvetkov , F Milano S-E Strand5, J-Y Giraud, C Lewis. *Medical Physics Thesaurus and International Dictionary. Medical Physics International Journal*. 2013;1(2):140-144.
5. EMITEL e-Encyclopedia of Medical Physics 2014 [Available from: <http://www.emitel2.eu/>].
6. Ishmael Parsai et al. *PARSA Dictionary, The Oxford Translator*. Tehran, Iran: Azad University; 2017.
7. Seyed Rabi Mahdavi, Behrouz Rasuli, Azam Niroomand-Rad. Education and training of medical physics in Iran: the past, the present and the future *Physica Medica*. 2017;(accepted manuscript).
8. EMIT Medical Physics e-Dictionary only, 2006, [Available from: <http://www.emitdictionary.co.uk/>].

**Corresp. Author:** Azam Niroomand-Rad, e-mail: [azam@georgetown.edu](mailto:azam@georgetown.edu)

**Table 1. Proposed “common and correct” translations for some of the medical physics terms in EMITEL that required revision**

EMITEL Term	Translation in EMITEL	Common and correct translation
CT (Computed Tomography)	ترموگرافی محاسبه شده	برش نگاری رایانه ای
Functional MRI (fMRI)	MRI کارآمد	MRI فانکشنال / مبتنی بر عملکرده بافت / عملکردی
Interventional MRI	MRI وقفه ای	MRI مداخله ای
Build up dose	دز ترقی	دز (ناحیه) انباشت
Dose Area Product	سطح دز ایجاد شده	حاصل ضرب دوز در سطح میدان تابش
Dose calibrators	درجه بند سازهای دز	کالیبراتورهای دوز
Dose conversion factors	عامل های واگردانی دز	عامل های تبدیل دوز
Dose length product	طول دز تولیدی	حاصل ضرب دوز در طول اسکن
Dose monitoring	دیدبانی دز	بایش دز
Dose tolerance	رواداری دز	تحمل دز
Dose width product(DWP)	بهنای دز حاصله	حاصل ضرب دز در عرض(میدان)
Implant dose distribution	توزیع دز تزریقی	توزیع دز اطراف چشمه کاشت شده (در براکی ترایی)
Integral dose	دز کامل	دز تجمعی
Normal organ dose tolerance	تحمل دز اندام بهنجار	دز نرمال تحمل بافت
Normal tissue dose	دز بافت بهنجار	دز نرمال بافت
Normalized treatment dose	دز دوزمانی بهنجار شده	دز درمانی بهنجار / نرمال
Percentage depth dose	درصد دز ژرف	درصد دز عمقی
Time dose fractionation	جزء به جزء سازی دز زمانی	تقسیم دز کل به دز در چند جلسه در پرتو درمانی)
Asymmetric film screen	برده فیلم برتقارن	فیلم اسکرین های نامتقارن
FFD (Focal film distance)	فاصله کانونی فیلم	فاصله فیلم تا نقطه کانونی تیوب
Film badge	نشان فیلم	فیلم بچ/ بچ فیلم
Film crystals	بلورهای لایه نازک	کریستال (دانه های بلور در امولسیون) فیلم
Acquisition modes for digital image	مدای یابش برای تصویر رقمی	روش های داده گیری برای تصویر دیجیتال
Analogue image	تصویر مانسته	تصویر آنالوگ
Image artifact	دست ساخته تصویر	آرتیفکت تصویر
Image fusion	ذوب تصویر	ادغام تصویر، ترکیب تصویر
Image guided radiotherapy	تصویر راهنمای رادیوتراپی	پرتو درمانی با هدایت تصویر
Portal image	تصویر مدخل	تصویر پورتال
Lead protection	حفاظت از آثار سوء سرب	حفاظت سربی
Extra focal radiation	کانون اضافی تابش	تابش تولید شده در لامپ اشعه ایکس غیر از نقطه کانونی
Radiation biology	تابش زیستی	زیست شناسی پرتوی
Radiation exposure	نوردهی تابش	پرتوگیری / پرتودهی تابش
Radiation monitoring	تنظیم تابش	بایش پرتوی
Radiation quality	کمیت تابش	کیفیت تابش
Bolus- radiotherapy	رادیوتراپی قطعه ای	بلوس رادیو تراپی/ پرتو درمانی
Inverse radiotherapy planning	برنامه ریزی رادیوتراپی وارون	طراحی درمان معکوس