

EDITORIAL RESEARCH

Exploration on the use of abbreviations in Chinese medical journals as units of measurement: A case study of “ppb”

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ABSTRACT

In the editorial work, abbreviations of English names are often encountered as symbols of measurement units, which are not in line with editorial norms. This study investigated the implementation of standardization in Chinese medical journals by taking “part per billion (ppb)” as an example, analyzed the reasons for its difficulty in implementation, and provided corresponding countermeasures, in order to provide reasonable suggestions for promoting the implementation of national standardization. During the editorial work, it was found that “ppb” was mostly used as a symbol of measurement units for fractional exhaled nitric oxide (FeNO) in exhaled breath. Therefore, “FeNO” and “fractional exhaled nitric oxide” were used as keywords to retrieve relevant literature on China National Knowledge Infrastructure (CNKI, <https://www.cnki.net/>) from January 2021 to July 2023. A total of 116 articles were retrieved, 8 of which were removed as reviews, or meta-analyses, and other articles without symbols of measurement units. A total of 108 articles were retrieved. Among the 108 articles, only 2 (1.85%) complied with editorial norms, 78 (72.22%) still used “ppb” as a symbol of measurement units, and 28 (25.93%) had different errors. Medical sci-technology journals have a long way to go in implementing the standardization of measurement unit symbols. It requires international and domestic standards and guidelines to be revised from top to bottom, further cooperation and adjustment from instrument manufacturers, and gradual adaptation of clinicians to new standards and norms, in order to fulfill their respective responsibilities in promoting the national standardization process.

Key words: editing standards, unit symbols, English abbreviations

INTRODUCTION

In the process of editing, it is often encountered that abbreviations of English names are used as symbols for measurement units. However, according to the *General principles concerning quantities, units, and symbols* (GB

3101—1993) in China, abbreviations of English words cannot be used as symbols for measurement units.^[1] Editors encounter some resistance in implementing the standard, so this study first surveys the implementation of standardization in medical sci-technology journals, then analyzes the reasons for its difficulty in implementation and proposes corresponding countermeasures to promote the implementation of national standardization.


In medical sci-technology journals, common abbreviations used as units of measurement include “part per million (ppm)”, “part per billion (ppb)”, and “part per trillion (ppt)”. These are abbreviations of English names that indicate the quantity share.^[2] The original meaning of “ppm” is 10^{-6} , while “ppb” and “ppt” represent different orders of magnitude in different countries,

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such as 10^{-9} and 10^{-12} in the United States and France, respectively, and 10^{-12} and 10^{-18} in the United Kingdom and Germany, respectively. Therefore, the results obtained without annotation are completely different. This article takes “ppb” as an example to investigate the implementation of standardization in various medical journals from January 2021 to July 2023.

THE CURRENT SITUATION OF USING “PPB” AS THE EXPRESSION FORM OF MEASUREMENT UNIT SYMBOLS

During the editing process, it was found that “ppb” is mostly used as a unit symbol for measuring fractional exhaled nitric oxide (FeNO). Therefore, the keywords “fractional exhaled nitric oxide” and “FeNO” were used to search for relevant literature on the China National Knowledge Infrastructure (CNKI, www.CNKI.net) from January 2021 to July 2023. A total of 116 articles were retrieved, and 8 articles without unit symbols such as reviews and meta-analyses were excluded. The screening process of literature is shown in Figure 1, and the unit symbol expression forms of 108 articles are shown in Table 1.

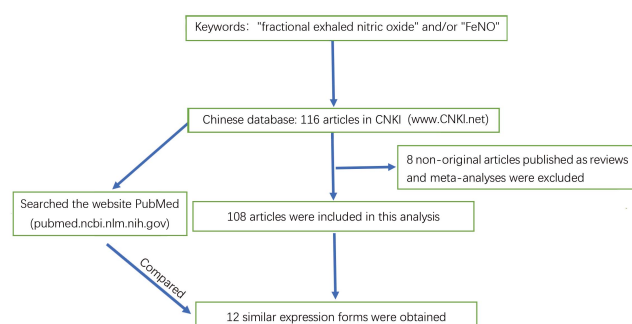


Figure 1. The flowchart of the literature screening. CNKI, China National Knowledge Infrastructure.

As shown in Table 1, only 2 (1.85%) of the 108 articles comply with the editorial standards, and 78 articles (72.22%) still use “ppb” as the unit symbol for measurement, including 2 (1.85%) with errors in terms of capitalization. There are also 28 articles (25.93%) with different errors, 6 (5.56%) of which have conversion marks but add “mol/L” after 10^{-9} as the units, and 4 (3.70%) of which are converted to 10^9 mol/L, which expands the data. Other expressions are also incorrect, such as $\mu\text{g/g}$, $\mu\text{g/L}$, %, ppd, and bbp.

Of the 108 articles, 91 (84.26%) specifically explained the model and manufacturer of the instrument used to detect fractional exhaled nitric oxide. Among them, 49 (53.85%) were produced by Sunvou Medical Electronics

Co., Ltd. (www.sunvou.com) for the Nano Coulomb nitric oxide breath analyzer, 34 (37.36%) were produced by Sweden Circassia Ltd. (www.circassia.com) for the NIOX MINO[®]/NIOX VERO[®] nitric oxide analyzer, and others were produced by Guangzhou Ruipu Medical Technology Co., Ltd. (www.ruibreath.com) for the Rui Breath[®] medical nitric oxide detector; Hefei Weigu Medical Technology Co., Ltd. (www.brenotech.net) for the exhaled nitric oxide detector; Eco Physics AG (www.ecophysics.com) for ANALYZER CLD 88 sp with DENOX 88 nitric oxide detection analyzer, and Bedford Scientific Ltd. (www.bedfont.com) for NObreath[®] FeNO monitor.

At the same time, we also searched the website of PubMed (<https://pubmed.ncbi.nlm.nih.gov/>) using the keyword “fractional exhaled nitric oxide/FeNO”. We found that the unit of FeNO is also expressed with “ppb” form, such as “FeNO levels usually rise above 25 ppb”,^[3] “FeNO was statistically significantly higher in patients with AD than in healthy controls (60.5 ± 35.1 vs. 14.8 ± 5.1 ppb, $P < 0.001$)”,^[4] “FeNO ≥ 25 ppb was significantly associated with mortality hazard ratio (HR) 0.094, 95% confidence interval (CI) 0.034–0.260, $P < 0.001$ ”,^[5] and “Sixty-eight percent of the patients had FeNO values below 50 ppb”.^[6]

CAUSE OF FORMATION

International standards of “ppb”

In 2014, the European Respiratory Society (ERS) and the American Thoracic Society (ATS) released the first edition of guidelines for severe asthma in adults and school-aged children that “ppb” is mentioned firstly. In February 2020, ERS and ATS jointly released a new version of the management guidelines for severe asthma.^[7] The normal value of FeNO described in the guideline is < 19.5 ppb. In these documents, “ppb” means 10^{-9} , which refers to the quantity share or order of magnitude.

National standards of “ppb” in China

Based on the “Chinese Expert Consensus on the Clinical Application of Non-invasive Airway Inflammation Assessment for Asthma”^[8] published by the Society of Respiratory, Chinese Medical Doctor Association in 2015, and with reference to relevant international guidelines and important literature, the “Chinese Expert Consensus on the Detection of Exhaled Nitric Oxide and Its Application in the Diagnosis and Treatment of Airway Diseases”^[9] was written. The consensus points out that the concentration of FeNO is part per billion, or “ppb”.

Instrument for measuring FeNO

According to incomplete statistics, the results of the

Table 1: The expression forms of the unit symbols for exhaled nitric oxide in 108 articles (n = 108)

Expression forms	Number
× 10 ⁻⁹	2 (1.85%)
ppb	78 (72.22%)
Expressed in “ppb”, with the conversion formula noted (ppb = 1 × 10 ⁻⁹ mol/L)	6 (5.56%)
Expressed in “ppb”, with the conversion formula noted (ppb = 1×10 ⁹ mol/L)	4 (3.70%)
× 10 ⁻⁹ mol/L	2 (1.85%)
× 10 ⁹ mol/L	2 (1.85%)
μg/g	1 (0.93%)
μg/L	6 (5.56%)
%	1 (0.93%)
Ppb/PPB	2 (1.85%)
ppd	3 (2.78%)
bbp	1 (0.93%)

ppb, part per billion.

measured values are expressed as “ppb” for both imported instruments and instruments produced in China.

Reading of measurement result data

Because the content of nitric oxide in exhaled air is extremely small, the measured value is too small. After being expressed by Scientific notation, it is more intuitive to use its English abbreviation as the unit to judge the value size. Therefore, it is reasonable and convenient.

STRATEGIES AND SUGGESTIONS

Based on the above reasons, we support that it is customary to use “ppb” to express the FeNO value in clinical practice. If it is converted to Scientific notation, the author and the reader will not understand it clearly, which will interfere with the determination of whether the data is normal. This is very similar to the standardized expression of clinical blood pressure, but not exactly the same to it. In the past, the clinical practice has always used “mmHg” to express blood pressure values. In order to align with international standards, the standard is expressed in “kPa”. However, in practical work, using “kPa” to express blood pressure cannot visually indicate the level of blood pressure. So after a period of implementation, the expression method of “mmHg” was restored, and the conversion formula to “kPa” was noted thereafter. Therefore, on the one hand, we call for the international and domestic standards to change the expression of FeNO, abandon the form of “ppb”, and change it to Scientific notation. Then, the manufacturer of the instrument used to measure FeNO will also adjust the data reading parameters according to international and domestic standards, so that the author and reader will naturally

change to the correct expressing. On the other hand, it is suggested to keep the format of “ppb” in the papers at present, and mark the conversion formula behind the Scientific notation, such as 5 × 10⁻⁹ (1 × 10⁻⁹ = 1 ppb). In addition, during the conversion process, it is important to avoid incorrect expressions such as bbp,^[10] ppd,^[11–13] %, ^[14] μg/g, ^[15] μg/L,^[16–18] and 10⁹.^[19–20]

In summary, medical sci-technology journals have a long way to go in implementing the standardization of measurement unit symbols. International and domestic standards and guidelines need to be revised from top to bottom, instrument manufacturers need to further cooperate and adjust, and clinicians need to gradually adapt to the new standards and norms, all playing their part in promoting the national standardization process.

DECLARATIONS

Author contributions

Liu Y: Writing—Original draft. Chen J: Project administration, Writing—Review and Editing. Wu D: Inductive documents. All authors have read and approve the final version.

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Conflict of interest

The author has no conflicts of interest to declare.

Data sharing

All data has been included in this paper.

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