

# Information Overload: We Need to Improve the Signal-to-Noise Ratio

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Wikipedia defines information overload as “an excess amount of information being provided, making processing and absorbing tasks very difficult for the individual because sometimes we cannot see the validity behind the information ... and the risk of misinformation. [It is] ‘a symptom of the high-tech age, which is too much for one human being to absorb in an expanding world of people and technology.’”<sup>1</sup> Reasons for information overload are improved access to information, exploding amounts of new information, expanding mechanisms for duplication and dissemination of information, contradictions and inaccuracies in available information, and a perceived lack of a standard method for comparing and processing information—all of which ultimately lead to “information pollution” and a “low signal-to-noise ratio”.<sup>1</sup>

Pharmacists are viewed by the public and other health care professionals as health and drug information experts who can guide patients through the data minefield, providing unique insight, sound judgment, and practical perspective on the risks, benefits, and value of medications to prevent and treat diseases and improve patient care. However, it is becoming increasingly difficult to perform this task, as pharmacists are bombarded by mantras of “miracle” medications, the “lurking dangers” of newly discovered drug reactions and interactions, and flavour-of-the-week lifestyle “makeovers”.<sup>2</sup> If we do not acknowledge the impact of this problem, apply proven, effective coping strategies, and investigate novel solutions to withstand the barrage of information, the very data upon which we rely to promote safe, effective, cost-conscious therapy will paralyze us.

Today, drug information is more accessible than ever before, and massive amounts of information can be at our fingertips in seconds. A recent PubMed search on the term “drug” identified over 3.4 million article “hits”. Limiting the search to English articles relating to humans revealed a still-overwhelming 5320 randomized controlled trials, 610 meta-analyses, and 165 clinical practice guidelines! However, this relatively high-quality information, which can be searched for and retrieved selectively in a controlled fashion, is not what is

threatening the “signal-to-noise ratio”. Rather, the existence of myriad indexing and abstracting services, drug information websites, and mass media reports is leading to rampant duplicate dissemination of information; furthermore, the information being “pushed” to us may be incompletely, inaccurately, or incorrectly reported, interpreted, or applied.<sup>3</sup> Think of how many conflicting news reports you have heard about the clinical effects of caffeine, red wine, chocolate, and vitamin supplements, often generated by studies that have been poorly conducted, inaccurately reported, or inappropriately applied. Prescription medication information adds an additional level of complexity and confusion, contributing to the loss of “signal” in the field of “noise”. This situation generates urgent questions from confused patients and agitated health care professionals, who far too often are asking how to change drug therapy before assessing the faulty information upon which reports are based.

The evidence-based medicine approach will help us to wade through the plethora of information, and pharmacists must take responsibility for applying their knowledge, skills, attitude, and behaviour to assess the “signal” in the “noise”. We must be committed to asking focused questions; retrieving the best available evidence; evaluating clinically important outcomes; critically appraising the evidence to see if we can believe the results; understanding the magnitude of the risks, benefits, and costs; and determining if and how the results should be applied to our patients. As we become increasingly pressed for time, it is tempting to take the path of least resistance, to simply conform with prevailing published opinion. But we must resist this temptation and endeavour to assess the “signal”, rather than being swayed into action by the “noise”.



We also need better systems to support us. When articles are submitted to, and ultimately published in, journals such as the *CJHP*, their “signal” will be amplified through multiple channels of duplication and dissemination. The editorial boards for such journals must therefore ensure the quality of study methodology and the accuracy of reporting. Furthermore, the limitations of the research must be acknowledged, the results should be interpreted within the context of all available evidence, and the conclusions and recommendations must not be overstated.

Earlier this year, the *CJHP* took additional steps to support authors, editors, and reviewers and to help minimize bias and “noise” in research papers by collating a variety of research tools that have been developed to improve the quality of conduct and accuracy of reporting of meta-analyses (QUOROM [Quality Of Reporting Of Meta-analyses]), randomized controlled trials (CONSORT [Consolidated Standards of Reporting Trials]), nonrandomized controlled trials (TREND [Transparent Reporting of Evaluations with Nonrandomized Designs]), and observational trials (STROBE [Strengthening the Reporting of Observational studies in Epidemiology]).<sup>4</sup> Of note, the QUOROM statement has been recently updated and expanded and will be published soon under the new name PRISMA (Preferred Reporting of Systematic Reviews and Meta-Analyses).<sup>5</sup>

The *CJHP* also supports the open discussion of clinical controversies through its Point Counterpoint column, a forum for uncovering the totality of the evidence, providing a more balanced discussion on important topics, and adding clarity to the “signal”. In this issue of the Journal, the Point Counterpoint column highlights the clinical controversy about extending the window of thrombolysis for acute ischemic stroke from 3 to 4.5 h.<sup>6,7</sup> The mass media and reports for health care professionals have almost universally embraced the results of the ECASS III trial (the European Cooperative Acute Stroke Study III)<sup>8</sup> and have perhaps too hastily updated clinical practice guidelines, with surprisingly little publication of overtly dissenting views. For example, a Medscape article entitled “ECASS 3 [sic] gets a warm welcome from the stroke community”, published online in early October 2008, quoted 8 physicians, all of whom had positive comments on the ECASS III trial and all of whom endorsed extension of the window of thrombolysis.<sup>9</sup> Although this article may not represent the complete “signal” on this issue, it carries tremendous influence. In their enthusiasm, pharmacy and therapeutics committees and developers of clinical pathways and preprinted orders may not have stopped to critically

appraise all of the relevant evidence and consider the overall risks and benefits of extending the window of thrombolysis. We hope that the *CJHP* and its Point Counterpoint column will continue to provide a forum for pharmacists to answer questions like these and also encourage them to take time to question the answers. This forum should help to improve the clarity of the drug information “signal” in the overwhelming “noise” that increasingly detracts from our advocacy of safe, effective, and cost-conscious therapy for our patients.

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