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Editorial

Medical Science - "Drowned in Data but Starved for Information"!

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Three and a half decades down the line in 1985, Rutherford D. Rogers opined "we are drowning in information, but we are starved for knowledge.[1] This still holds good with some amendments, particularly in the field of medicine. Here, we can safely amend the information to data, and knowledge to information though with some caveats. The recognized sequences are data, information, knowledge and wisdom (DIKW).[2] Let us have a closer and contextual look at the first two entities with some ephemeral remarks on the others. Though data and information are sometimes misunderstood as interchangeable lexes, the difference is blatant.

Data: According to Tec Differences, "Data is raw, unanalyzed, unorganized, unrelated, uninterrupted material which is used to derive information, after analyzation."[3] This includes observations, facts and figures, which are independent. They are measured and stored in 'bits and bytes' and are irrelevant unless analyzed.

Usually, we have two types of data, raw and processed. Raw data has many synonyms, primary data, atomic data, and source data to name a few. Like an unprocessed diamond just mined out, raw data is the observation that has just been collected from various sources. They are disorganized, haphazard and jumbled up mixtures of different observations that usually lack clear insight. They need serious cleaning before informative analysis. Thus, the limitations of this type of data are, the probability of the existence of errors, invalid data, their non-uniform nature, etc.[4]

Processed Data: It too has synonyms like cooked data. This constitutes organization, extraction, etc. of relevant and valuable observations from raw data to a format that the analyzer, either a person or a computer (machine) can easily understand and interpret to create useful information.[5] Thus, the processed data most often than not, provide a clear insight. They frequently end up in a database that is available for additional deep analysis. So, while raw data is like an uncut diamond, processed data are the polished one, ready to sparkle.

Data processing can be carried out by simple approaches, as use of spreadsheets like Microsoft Excel and Google sheets where the user can format, organize and generate graphs to reveal simple trends and summaries; to complex systems like business intelligence (BI)

programs with forecasting potential, and machine learning (ML) techniques for developing (building) user-friendly management supportive models. [6]

So, as we see there is an established protocol for data handling. It can be safely amalgamated to the following sequence of events. This is known as the data cycle.[7,8] The sequence events in the traditional data cycle are:

- **Planning:** A sound plan in place for efficient data collection
- **Acquiring:** A methodological approach to acquire/ collect the planned data
- **Processing:** After acquiring the planned data they are subjected to different processing methods that make it analysis meaningful
- **Analyzing:** Once the data is processed it is subjected to informative analysis by different methods depending on their nature. The result of the analysis is one of the essential steps in converting the raw data into a meaningful one that is convenient for evidence synthesis and decision making
- **Integrating:** Integration of big data is the future for data management. It has come out in a big way to assemble, process and analyze huge data sources for meaningful and usable application in diverse fields. Its use in the health sector is perceived as a game-changer. Thus, data science for managing big data has emerged as a new and demanding field. Important examples of big data applications in the health sector are the use of AI (Artificial Intelligence) and mathematical modellers. They analyze huge amounts of raw data to generate useful guidelines that are of immense help to clinicians and health care decision-makers. The latest example is predicting and managing the ongoing Sars CoV -2 pandemic
- **Storing:** Storge of data, raw and processed for future use by cloud computing and other forms of mega data banks are considered as an important part of real-time data management. Their use and referral at the time of need are foreseen as a cost-effective and viable option to enrich medical information for a future time.

Information: Information is applying description and meaning to data to make it useful for the recipient. Let us have an example to understand the difference between data and information. The figure "100" is data, by adding a unit of measurement, say weight in kilogram, it becomes "100 kg" a meaningful term that we call information. How heavy is 100 kg to lift or carry by a normal person is knowledge and who should attempt this activity (with out harm) is wisdom. Thus, information is one step up in the intelligence hierarchy of the Data-Information-Knowledge-Wisdom (DIKW) pyramid.

So, we can safely synopsize by saying that the source of information must be reliable without missing details. The additional features to enhance information quality are, it must come from an updated, timely and non-disputing data system.

For a gross understanding of 'DIKW' pyramid, a quick touch on the concept of knowledge and wisdom is mandated here.[9,10]

"Knowledge" is usable synthesized information that can lead to decision making in varied ways like developing models, simulations etc. While "wisdom" is the amalgamated application of synthesized information, knowledge and experience to real-life events.

The 'DIKW' pyramid in recent times is undergoing a sea of changes with the evolving data management system that includes Artificial intelligence (AI), machine learning and management of big data.[5-7,9] Especially in the field of medical sciences, they are showing immense potential in lending a much needed helping hand to clinicians, surgeons, dentists, physiotherapists, radiologists, laboratories, and scientists. In reality, its application has touched all spheres of human life. It has given birth to individualized/ personalized medicine that has touched upon the lives of millions and is set to bring a major change in delivering modern-day health care.

Thus, the time has come for all healthcare professionals to turn the tide in their favour by actively participating in this revolution in data science and health care informatics. We should ensure that the days are gone where we were "Drowned in data but starved for information." The new dawn has arisen.

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