

Published: August 31, 2023

**Citation:** Edden Y, Ben-Shachar E, et al., 2023. Clinical Outcomes Role in The Healthcare Industry, The Complexity of Procurement and Applied Implications, Medical Research Archives, [online] 11(8). <https://doi.org/10.18103/mra.v11i8.4148>

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DOI  
<https://doi.org/10.18103/mra.v11i8.4148>

ISSN: 2375-1924

## RESEARCH ARTICLE

### Clinical Outcomes Role in The Healthcare Industry, The Complexity of Procurement and Applied Implications

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#### ABSTRACT:

“Clinical outcomes” has become a popular phrase among clinicians, hospital managers, government regulators, health insurers, policy makers and healthcare economy specialists. Compared to other sectors, the health care industry has a different approach to quality measurement since classic tools and basic principles such as economic profitability or human resources necessity in many occasions do not apply. Among other reasons, this is due to the complexities related to characterizing various aspects surrounding care and the fact that high-quality care is not always correlated with desired outcomes. Therefore, measures recommended by traditional methods sometimes simply cannot be implemented. Since the “end product” of the healthcare pipeline can be multifaceted and frequently hard to define, the most logical solution would be to measure it by clinical outcomes.

In this paper, we will review the literature on this issue and describe the process of extracting the data and defining which indices will be measures at Sheba Medical Center in order to evaluate clinical outcomes.

## Introduction

Clinical outcomes appear to be most indicative marker of the medical profession's performance. Similar to elite athletes' pursuit of ultimate performance and unsurpassed results, the healthcare industry is constantly searching for methods to become better, more efficient, and more productive.<sup>1-3</sup> Like professional athletes that analyze each and every movement, frame by frame, aiming to reach maximal efficiency and perfection, the healthcare industry has to fragment processes and measure outcomes in order to evaluate itself. Unlike athletes' results, which are clear almost immediately, healthcare outcomes may take a long time after the intervention has been completed to develop. A few examples are as follows:

- The lack of post-operative complications is defined thirty days after an operation.
- An oncologic patient is usually considered 'cured' when there is no evidence of disease five years after the initial diagnosis.

As important as procedural parameters might be, we assert that a patient's clinical outcomes and experience should be the greatest factor when determining the quality of the medical service provided.

Health services research refers to a comprehensive model based on three pillars - **structures, processes, and outcomes** of care. This model suggests that the **structures** of healthcare (e.g., buildings, staffing ratios, and equipment) affect the **processes** of healthcare (e.g., provider decision-making, physician-patient relationship, etc.). These processes in turn shape **outcomes**. The three pillars are in continuous balance and interaction with each other. Health services research is mainly aimed at defining links and associations between structure and process that ultimately **maximize patient outcomes** while improving treatment quality and safety (if possible, without increasing cost).<sup>4</sup>

The process of defining the key parameter to be measured, measuring and collecting the data, analyzing the data, and implementing changes based on the findings is more complicated than would be expected.

In the era of electronic medical records, we are gathering vast amounts of data, enabling us to extract meaningful information using algorithms as well as artificial and business intelligence. However, clinicians tend to underreport complications, poor outcomes, and unsatisfying results. An organizational culture of strict data documentation is of the utmost importance in creating reliable outcomes indices that will provide a better

understanding of the overall treatment process to help us improve the quality of care.

## Methods

### Work algorithm

A special Clinical Outcomes team was established at Sheba Medical Center (SMC) to foster institutional momentum and awareness while consolidating efforts and resources as well as maximizing efficiency. The team is comprised of representatives from several disciplines, including surgery, pediatrics, nursing, patient safety, care quality, healthcare economics, and data science. Following national (Israeli) and international discussions with similar medical centers, we have studied our clinical departments for their knowledge, needs, and evidence of relevant clinical outcomes for each sector. Based on these, we initiated data extraction and analysis.

### Data extraction

We used an independent, specialized software named MDClone that incorporates the entire institution's data lake. Data is transferred from diverse, independent operating software systems at SMC (e.g. Electronic Medical Records (EMR), billing, and imaging) as well as national population death records to provide mortality that did not occur in our medical center.

## Results

Four months into the process, we have established the following indices for different disciplines:

- Readmission as it relates to length of the initial stay in the Internal Medicine division
- Definite vs. expected number of complication following colorectal resections including the following:
  - Mortality
  - Surgical site infection (SSI)
  - Anastomotic leaks
  - Readmission
  - Use of antibiotics in the post-operative period
- Number of SSI after caesarian sections
- Complications succeeding trauma and urgent surgery:
  - Mortality
  - SSI
  - Bowel resection for incarcerated hernias
  - Sepsis
  - Intensive care unit (ICU) stay
- Post-operative complications among octogenarian patients undergoing pre-habilitation for elective surgery:
  - Mortality

- SSI
- Pulmonary complications
- Delirium
- Length of stay
- Placement after discharge

These indices of clinical outcomes will be published and discussed independently in the relevant literature as well as on SMC's website as part of the organizations' policy of transparency when it comes to its data.

### Discussion

'Clinical outcomes' refer to the results or effects of medical interventions, treatments, or procedures on patients' health and well-being. These outcomes are essential indicators of the quality and effectiveness of healthcare delivery.

1. Mortality and morbidity rates including adverse events and Complications.
2. Treatment Success Rates: clinical outcomes are often assessed by the success rates of specific treatments or procedures. For example, in surgical specialties, success may be defined by factors such as complete tumor removal, minimal post-operative complications, and a faster recovery.
3. Patient Satisfaction: Beyond clinical measures, patient satisfaction is an important outcome that reflects the quality of care provided. It involves factors such as communication, empathy, accessibility, and the overall patient experience.
4. Quality of Life: Particularly in chronic or long-term conditions. The health care industry is not only on extending life but also on ensuring that patients can live with dignity, minimal pain, and a satisfactory level of physical, emotional, and social functioning.
5. Collaboration and Multidisciplinary Care: Clinical outcomes are often influenced by the collaboration and coordination of a multidisciplinary healthcare team.

Extracting clinical outcomes data from a medical center's database typically involves a series of steps, including data collection, data cleaning, and data analysis.

1. Data collection: The first step is to identify the data elements that are relevant to the clinical question being asked. These data elements may include patient demographics, clinical diagnoses, laboratory results, medication records, and other clinical data. The data may be

collected from electronic medical records, claims data, or other sources.

2. Data cleaning: Once the relevant data elements have been identified, they must be extracted from the medical center's database and stored in a format that can be used for analysis. This may involve different steps in order to ensure that it is accurate and consistent.
3. Data analysis: The final step is to examine the data in order to extract clinical outcomes of interest. This may involve calculating mortality rates, response rates, time to event, or other relevant measures. This may involve statistical methods.

The specific methods used to extract clinical outcomes data will depend on the database's structure, the available data elements, and the clinical question being asked. In our case, a specialized software was used to both extract and analyze the data. It is critical to ensure that the data is precise, comprehensive, and characteristic of the patient population being studied in order to obtain reliable results.

Defining clinical outcomes involves selecting the most appropriate measures to assess the effectiveness of a particular healthcare intervention or treatment. There is no optimal way to define clinical outcomes, as the most appropriate outcome measures will depend on the specific clinical question being asked, the patient population being studied, and the goals of the intervention or treatment.

However, these aspects should always be considered:

1. Relevance: The outcome measures should be germane to the clinical question being asked and should reflect the desired outcome of the intervention or treatment.
2. Validity: The outcome measures should accurately measure the intended clinical outcome. This can be assessed by evaluating the reliability, responsiveness, and sensitivity of the outcome measures.
3. Reliability: The outcome measures should produce consistent results when used repeatedly.
4. Feasibility: The outcome measures should be easily and reliably measured in the patient population being studied.
5. Availability: The measured data should be available before and after changes are implemented in order to have accurate evaluation of the action.

6. **Acceptability:** The outcome measures should be unobjectionable to patients, clinicians, and other stakeholders involved in the intervention or treatment.

The implications of clinical outcomes data on medical practice are significant and noteworthy.<sup>1-6</sup>

By providing objective data on the effectiveness and safety of medical interventions, clinical outcomes can direct medical decision-making in addition to more generally improving clinical practice and processes and enhancing the overall quality of healthcare. Furthermore, clinical outcomes data can help identify areas in need for improvement and guide the development of new treatments and interventions.

The economic aspects of clinical outcomes data are also impactful and should not be overlooked. Healthcare costs have risen dramatically in recent years and are expected to continue to increase.<sup>7,8</sup> Clinical outcomes data can help identify areas where cost reduction can be achieved while still maintaining or improving patient outcomes. Improving these can lead to a healthier population, which can result in lower healthcare costs at the national level over time. Moreover, such data can initiate and drive innovation in the healthcare industry, leading to the development of new treatments and technologies that can benefit patients and at the same time contribute to economic growth. In these cases, economic aspects are closely intertwined with medical and scientific ones. Thus, by providing valuable insights into the effectiveness and cost-efficiency of healthcare interventions, we can improve patient outcomes, drive innovation, and contribute to economic growth.

Carefully selected and judiciously depicted clinical outcomes indices conceivably will interact and may be relevant to several aspects in the near future:

1. **Precision Medicine:** The emergence of precision medicine, which takes into account individual variability in genes, environment, and lifestyle, has the potential to revolutionize clinical outcomes. By tailoring interventions and treatments to each patient's unique characteristics, precision medicine can enhance the effectiveness and personalization of care, leading to improved clinical outcomes.
2. **Integration of Artificial Intelligence (AI):** AI-powered technologies, such as machine learning and natural language processing, have the potential to transform clinical outcomes. AI algorithms can analyze vast amounts of patient data, identify patterns, and generate insights

that can assist medical professionals in making more accurate diagnoses, treatment decisions, and prognostic predictions, ultimately improving clinical outcomes.

3. **Patient-Reported Outcomes (PROMs):** The incorporation of patient-reported outcomes, such as quality of life measures, symptom assessments, and treatment satisfaction surveys, is gaining momentum in healthcare. PROMs provide valuable insights into patients' experiences, preferences, and treatment effectiveness. Integrating PROs into clinical practice can lead to patient-centered care, improved patient-provider communication, and enhanced clinical outcomes<sup>9,10</sup>.
4. **Value-Based Healthcare:** The shift towards value-based healthcare focuses on delivering high-quality care while considering the cost-effectiveness of interventions. In value-based models, clinical outcomes play a central role in determining reimbursement, healthcare resource allocation, and quality improvement initiatives. This approach incentivizes medical professionals to prioritize interventions that lead to positive outcomes while minimizing unnecessary procedures, reducing costs, and optimizing healthcare delivery.
5. **Digital Health Solutions:** The widespread adoption of digital health solutions, including telemedicine, remote monitoring, and mobile health applications, has the potential to improve clinical outcomes. These technologies enhance accessibility, enable early intervention, and empower patients to actively participate in their own care, leading to improved outcomes, especially in remote or underserved areas.
6. **Big Data and Population Health:** The integration of big data analytics and population health management can provide insights into trends, patterns, and determinants of health outcomes at a population level. By analyzing large-scale data, healthcare systems can identify areas for targeted interventions, allocate resources efficiently, and implement preventive measures, ultimately improving overall clinical outcomes in a community or population<sup>11</sup>.
7. **Real-time Monitoring and Predictive Analytics:** Advancements in wearable devices, remote monitoring technologies, and data analytics offer the potential for real-time tracking and analysis of patient health data. By continuously monitoring patient parameters and using predictive analytics, healthcare providers can identify early warning signs, predict outcomes,

and intervene proactively, leading to improved outcomes and reduced healthcare costs <sup>12</sup>.

### Conclusions

The healthcare industry has to provide self-accommodations to current trends and limited resources. Also, it has to find out of the box solutions that will allow productive and efficient delivery of the best care possible. Measuring clinical outcomes, the product of the health care “assembly line,” is a crucial step toward achieving these goals.

In order to successfully navigate a ship to her destination, the Captain must determine the exact

present location. Clinical outcomes provide our current longitude and latitude, the essential information to achieve our intention.

### Conflicts of Interest Statement

The authors have no conflicts of interest to declare.

### Acknowledgements

The authors would like to thanks **Ms. Karen Biala** for final proofreading of the manuscript.

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