As an oncologist, I have seen first-hand the very human toll of cancer. With the rising incidence and mortality of cancer globally, physicians and patients around the world face unprecedented complexity in navigating treatment while health systems are strained managing care for growing populations of patients.

As demand for oncology care rises, the global oncology workforce has not kept pace, leading to a shortage of expertise. As a result, physicians face formidable productivity and workflow challenges. In the US, over 40% of physicians experience burnout according to a 2018 survey. While this is an improvement from previous years studied, physicians remain at an increased risk for burnout.

EMR documentation and payer-preauthorization requirements are noteworthy. In some developing countries resource constraints are significant. Globally, many physicians are challenged by the need to stay current on the management of multiple neoplastic diseases, the proliferation of research publications, precision oncology, and clinical trial availability.

IBM Watson Health has been collaborating with physicians across the globe to understand their needs and to leverage artificial intelligence-based technologies to help them facilitate the delivery of high quality, cost effective care. Many of these solutions apply to all types of healthcare, including but not limited to oncology. Examples include secure hybrid data platforms, large scale claims-based analytics, natural language processing to ingest data from structured and unstructured sources, image analysis, drug discovery, genomics, longitudinal care management, and benefits administration. We also provide timely and comprehensive resources for healthcare professionals pertaining to drug information and broad-based medical practice.

Examples of capabilities that are focused specifically on cancer care include decision support for treatment selection, literature curation, clinical trials matching, and interpretation of next generation sequencing results. Our solutions have supported the delivery of cancer care in over 15 countries.

We are tackling the early application of AI in cancer care by working closely with our users to understand their needs and evolve our products.

Throughout this journey, we recognize the strengths of our clients and partners, viewing our progress as a continuous evolution that must be rooted in scientific data that provides insight into how our products are impacting care teams today in the real world. To-date, more than 100 studies have been conducted including the evaluation of our products’ efficacy. Here we provide a sample of these publications for your consideration.

As a practicing pediatric surgeon and health informatician, I know well the important role of scientific evidence in supporting clinical decisions and informing technology-investment decisions. IBM Watson Health is focused on combining data, analytics, and artificial intelligence (AI) to create solutions that can empower decision makers with actionable insights, with the goal of helping them to improve health and healthcare delivery. Watson Health is building on IBM’s long history of leading with science, and we are proud to present a growing body of scientific evidence demonstrating the performance and impact of Watson Health solutions in the area of cancer care.

The process of validating these tools requires a systematic progression of studies to demonstrate the performance, applicability, and value. The first step in evaluating any health information technology is maintaining the output so that it is technically accurate or correct. With oncology decision support, a systematic review of evaluation studies has demonstrated that therapeutic options have strong agreement with decisions made by expert multidisciplinary tumor boards — greater than with individual clinicians.1 These findings support clinical applicability and help illustrate the need for decision support in cancer care. Our natural language processing has been found to accurately identify relevant publications from bibliographic databases.7

Automated clinical trial screening technology has been shown to reliably exclude ineligible patients3,4,5 and accurately determine trial eligibility for breast and lung cancer patients.4,5 In the area of cancer genome variant data annotation and categorization, automated tools have been shown to have high concordance with expert molecular tumor boards in identifying actionable mutations from next generation tumor sequencing data.6,7

Once technical performance has been demonstrated, the next step in evaluating a clinical AI tools involves conducting studies of usability and workflow in the clinical setting. Our scientific portfolio includes studies providing evidence of user and patient satisfaction8,9 and improved patient engagement with oncology decision support.10 A community oncology practice found a 78% reduction in time to screen patients for clinical trials using automated clinical trial screening technology compared to manual screening,3,4 and AI-enabled technology has completed annotation and categorization of sequencing data in a fraction of the time required for manual curation.6,11

Finally, this compilation wouldn’t be complete without highlighting the value of real-world data to inform practice alongside traditional prospective research. The rich data assets offered by IBM Watson Health coupled with the experience of our scientists have delivered important insights for current practice and identified disparities and gaps in care.17,18,19,20

We are grateful to our pioneering collaborators who have provided evidence for the performance, usability, and impact of IBM Watson Health oncology and genomics solutions.


Clinical decision support
A prospective blinded study of 1000 cases analyzing the role of artificial intelligence: Watson for Oncology in change of decision making of a multidisciplinary tumor board (MDT) from a tertiary care cancer centre

Somashekhar SP et al. J Clin Oncol 37, 2019 (suppl; abstr 6533).
*no contributing IBM author

Link to study →

The study suggest[s] that cognitive computing decision support system[s] holds substantial promise to reduce cognitive burden on oncologist[s] by providing expert, updated, recent evidence-based [evidence-informed] insights for treatment-related decisions making.

Excerpt from abstract

MDT evaluated 1,000 breast, lung, and colorectal cancer cases

MDT was presented with Watson for Oncology’s treatment options

MDT reviewed and finalized their decision

The MDT changed their decision in 13.6% of the cases.

Reason for decision change:

- Evidence for newer treatments(s)
  - 55%
- More personalized treatment alternatives
  - 30%
- New genotypic, phenotypic and clinical insights
  - 15%
Concordance, decision impact and guidelines adherence using artificial intelligence in high-risk breast cancer*

*no contributing IBM author

When treatment decisions were altered, the newly selected therapies showed greater adherence to professional treatment guidelines.

Disclosure of Watson for Oncology options resulted in prescriber treatment changes in 106 or 5% of cases

The guideline adherence rate improved in the 106 cases where decision changes were made from 89 to 97%

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography
The establishment of a new medical model for tumor treatment combined with Watson for Oncology, MDT and patient involvement*  


*no contributing IBM author

Link to study →

The new model combined with human brain, artificial intelligence (AI) and cancer patients enriches the traditional MDT [multidisciplinary team] model. It is a new kind of medical model which is more effective.

Excerpt from abstract

Doctor and patient survey results indicated:

- Standardization and personalization of treatment recommendations
- Greater patient engagement in decision making

Multidisciplinary team (MDT)  
Patient  
Watson for Oncology

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography
Artificial intelligence-based clinical decision-support system improves cancer treatment and patient satisfaction


Link to study →

Excerpt from abstract

Enhanced patient knowledge around disease and treatment options can increase confidence in achieving positive outcomes. A new model of cancer care consultation assisted by Watson for Oncology was evaluated. The new 7-step model assisted by Watson for Oncology was compared to non-CDS system method (n = 70; new = 50; traditional = 20)

The 7-step model:

- Introduce WfO to patients
- Patients express desires
- Oncologist presents medical condition
- Discussion with team
- Input patients info WfO and review options
- Discuss and finalize options with patients
- Patient feedback

Patients in 7-step process indicated higher satisfaction in treatment options, confidence in health care workers, and willingness to follow treatment regimen.

Introduction to WfO

... patients build stronger confidence with their health care team and are willing to believe they will benefit from the treatment plans.

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography
The use of machine learning to identify relevant publications may reduce the time clinicians spend finding pertinent evidence for a patient.

Excerpt from abstract

A model was trained, using abstracts and titles from PubMed, to identify relevant clinical papers based on articles cited by 3 expert oncology sources:

Balanced training data:

**On-topic set:** cited in at least two expert sources

**Off-topic set:** published in lower-ranked journals

988 papers were classified with:

- **0.93** accuracy (95% CI, 0.9–0.96; p < 0.0001)
- **0.95** sensitivity
- **0.91** specificity
A systematic review of studies of concordance with expert opinion for a globally implemented oncology clinical decision-support system


Link to study →

Overall concordance between WfO therapeutic options and treatment decisions of MTBs and ICs was high, but significantly higher with MTBs. Concordance varied for cancer types and countries indicating a need for localization for regional difference.

The artificial intelligence-based clinical decision-support system for Watson for Oncology has been deployed in several institutions across the world. This study is a systematic review and meta-analysis of global studies evaluating concordance between WfO therapeutic options and treatment decisions of multidisciplinary tumor boards (MTBs) or individual clinicians (ICs).

Reviewed 27 unique study publications of 9,302 patients from 6 countries: China, India, South Korea, Brazil, Thailand and the United States.

Mean concordance for WfO and MTBs significantly higher than WfO and ICs (P < 0.0001)

### Overall Concordance

<table>
<thead>
<tr>
<th>WfO and MTBs</th>
<th>WfO and ICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 4,020 patients 15 studies</td>
<td>N = 5,282 patients 12 studies</td>
</tr>
<tr>
<td>China, India and South Korea</td>
<td>Brazil, China, South Korea, Thailand, US</td>
</tr>
<tr>
<td>Mean concordance was 77.5% (SD 17.2%)</td>
<td>Mean concordance was 67.4% (SD 13.7%)</td>
</tr>
</tbody>
</table>

**Foreword**

Key studies:
- Clinical decision support
- Clinical trials
- Genomics
- Real world data

**Bibliography**
Initial experience with Cancer Guidelines Navigator, a tool to standardize and improve the quality of cancer care in Sub-Saharan Africa, at Ocean Road Cancer Institute in Tanzania


Feedback on the utility of IBM Cancer Guidelines Navigator for easy and efficient use of this digital reference system designed to support easy and efficient access to regionalized cancer-treatment guidelines is promising for future Tanzania expansion plans.

The IBM Cancer Guidelines Navigator (CGN) was implemented hospital-wide at the Ocean Road Cancer Institute (ORCI) to help clinicians reduce treatment variability by increasing adherence to standard evidence-based care.

CGN presents corresponding treatment options in the National Comprehensive Cancer Network (NCCN) Harmonized Guidelines™ for Sub-Saharan Africa after clinicians enter a cancer patient case.

31 ORCI clinical and IT staff underwent CGN training; 12 answered a survey about their experiences and reported:

Benefits of the tool:

75% Quick access to guidelines and evidence

58% Ease of use

Areas for improvement:

42% Expanding cancer coverage

25% Better integration into the workflow

25% Offline access
Clinical trials
A pilot study to implement an artificial intelligence (AI) system for gastrointestinal cancer Clinical Trial Matching


Link to study →

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography

Implementation of Watson for CTM system with a CRC team may enable high volume patient screening for a large number of clinical trials in an efficient manner and promote awareness of clinical trial opportunities within the GI oncology practice.

Excerpt from manuscript

Clinical trials are critical to expanding understanding of disease treatment; however, screening for clinical trial enrollment is complex and time-consuming, leading to low rates of enrollment for newly diagnosed cancer patients.

35 patients
50 clinical trials

Clinical trials are critical to expanding understanding of disease treatment; however, screening for clinical trial enrollment is complex and time-consuming, leading to low rates of enrollment for newly diagnosed cancer patients.

35 patients with newly diagnosed gastrointestinal cancer screened for 50 clinical trials by clinical research coordinators with Watson for Clinical Trial Matching (CTM) and manual methods

Average Time to Screen (minutes per patient)

CTM
Manual

Average trials found (per patient)

CTM
Manual

0 2 4 6 8 10
0 10 20 30 40

p<0.0001

p<0.0001

*Mayo Clinic has a business collaboration with IBM Watson Health. This activity is not undertaken to allow IBM to indicate Mayo Clinic endorsement of any IBM product or service.
Impact of a cognitive computing clinical trial matching system in an ambulatory oncology practice

Haddad T et al. J Clin Oncol. 2018;36 (suppl; abstr 6550).

Link to study ➔

Cognitive technology supports increased enrollment in clinical trials for breast cancer.

In July 2016, Mayo Clinic* implemented IBM Watson for Clinical Trial Matching with a team of screening clinical research coordinators in its ambulatory practice for patients with breast cancer at the Rochester campus.

In the 18 months after implementation, there was on average an 84 percent increase in enrollment to Mayo’s systemic therapy clinical trials for breast cancer. The time to screen an individual patient for clinical trial matches also fell when compared with traditional manual methods.

Average monthly patient enrollment
Ambulatory breast cancer practice

Pre CTM

3.5

With CTM

6.4

This was further increased to 8.5 patients/month when including accruals to breast cancer cohorts of multi-disease, phase I trials within the experimental cancer therapeutics program.

*Mayo Clinic has a business collaboration with IBM Watson Health. This activity is not undertaken to allow IBM to indicate Mayo Clinic endorsement of any IBM product or service.
Artificial intelligence tool for optimizing eligibility screening for clinical trials in a large community cancer center.

This AI based clinical trial matching system reliably identified eligible patients for most trials in less time compared to manual review. This indicates potential for decreasing practitioner workload leading to increased efficiency of trial enrollment in busy practices.

997
WCTM system processed data for 997 unique patients across a set of 4 clinical trials.

Percentage of agreement between IBM WCTM and manual review for 239 randomly selected cases:

64.3–94.0%
Attribute extraction

81–96%
Trial eligibility determination

Eligibility screening time for the same 90 patients for 3 trials:

Manual clinical trial screening
Watson for Clinical Trial Matching

Less than 5% of cancer patients enroll in clinical trials. Community cancer centers play a vital role in clinical trial recruitment.

This study evaluated the performance of IBM® Watson™ for Clinical Trial Matching (WCTM) as compared to manual review for a large number of patients with breast cancer at Highlands Oncology Group.
Genomics
Clinical insights for hematological malignancies from an artificial intelligence decision-support tool


Link to study →

WfG variant interpretation correlated well with manually curated expert opinion and identified clinically actionable insights missed by manual interpretation... WfG has obviated the need for labor-intensive manual curation of clinical trials and therapy, enabling our center to exponentially scale our NGS operations.

Excerpt from abstract

54
South Korean patient cases with hematological malignancies were analyzed by Watson for Genomics (WfG)

71%
of cases had at least one clinically actionable therapeutic alteration

33%
of cases had genes that were targeted by a US FDA approved therapy

20%
of cases without therapeutic alterations, WfG identified additional diagnostic or prognostic insights

90%
of the manually interpreted cases were concordant with WfG analysis

WfG identified 9 more (33%) clinically actionable variants not found in manual assessment.

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography
Enhancing NGS-guided cancer center care through cognitive computing

Patel N et al. The Oncologist. 2018;23(2):179-185

Link to study →

Molecular tumor boards empowered by cognitive computing can significantly improve patient care by providing a fast, cost-effective, and comprehensive approach for data analysis in the delivery of precision medicine.

Excerpt from abstract

Providing current, accurate information on newly approved therapeutic options and open clinical trials requires considerable manual curation performed mainly by members of molecular tumor boards (MTBs).

Watson for Genomics’ automated analysis of genomic data took under 3 minutes per patient case.

In 99% of cases, Watson for Genomics identified variants previously defined as actionable by the human-only molecular tumor board.

In 32% of the patient cases, Watson for Genomics found additional potentially clinically actionable variants that a molecular tumor board had not identified.

1,018
Watson for Genomics analyzed 1,018 patient cases previously sequenced and analyzed

In 99% of cases, Watson for Genomics identified variants previously defined as actionable by the human-only molecular tumor board.
Genomic analysis of Myeloproliferative Neoplasm (MPN) Patients from a single institution in South Korea reveal novel pathogenic mutations and perturbed pathways


Link to study →

Insights gained from Next Generation Sequencing (NGS) and variant annotation are useful for risk stratification and understanding of disease development of MPN. In this study researchers, identified a different genetic variant profile for Korean patients with MPN than the comparison cohort.

31
31 South Korean patients with MPN underwent NGS. Results underwent variant interpretation and annotation by IBM Watson for Genomics. Results were compared to a cohort of 151 MPN patients previously published in the New England Journal of Medicine.

Two novel pathogenic mutations in CALR were identified: c.1162delG and c.1100_1145del

NOUTCH1 pathogenic mutations were exclusive

TP53 mutations were significantly enriched

MPL mutations were not detected

Insights gained from NGS can inform cancer care for hematologic cancers, especially BCR-ABL negative neoplasms (MPN). Mutational variants of Korean patients with MPN were studied to identify mutational profile variations specific to demographics.
Comprehensive analysis of advanced stage solid tumors from TCGA reveal widespread variation of genomics evidence levels across cancer types


For patients with advanced stage or refractory cancers, next generation sequencing with variant categorization and annotation may provide insights to physicians into potential precision targets.

This study examines the strength of clinical evidence of various advanced stage tumor samples from The Cancer Genome Atlas (TCGA).

Strength of biomarker/drug response associations was used for annotation with level 1/R1 strongest and level 4 weakest from clinical literature and FDA drug guidelines.

Thyroid and cutaneous melanoma cancers have the most level 1 (FDA approved drugs). Colorectal cancers have the most R1 (resistant) variants. Kidney and prostate cancers had no Level 1 evidence and the greatest proportion of unactionable tumors. Level 3 and 4 variants are promising as potential treatment targets.

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>N</th>
<th>Level 1 %</th>
<th>Level R1 %</th>
<th>Level 2A %</th>
<th>Level 2B %</th>
<th>Level 3A %</th>
<th>Level 3B %</th>
<th>Level 4 %</th>
<th>Unaction-able</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>514</td>
<td>1.2</td>
<td>0</td>
<td>0</td>
<td>35.2</td>
<td>23.5</td>
<td>2.7</td>
<td>37.4</td>
<td></td>
</tr>
<tr>
<td>Esophageal</td>
<td>495</td>
<td>3.0</td>
<td>0</td>
<td>0</td>
<td>72.1</td>
<td>6.7</td>
<td>5.7</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td>476</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>21.8</td>
<td>9.9</td>
<td>14.9</td>
<td>52.5</td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td>346</td>
<td>2.9</td>
<td>56.1</td>
<td>0</td>
<td>4.6</td>
<td>23.7</td>
<td>1.7</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Gastric</td>
<td>241</td>
<td>6.2</td>
<td>0</td>
<td>0</td>
<td>23.2</td>
<td>46.5</td>
<td>5.8</td>
<td>18.3</td>
<td></td>
</tr>
<tr>
<td>Cutaneous melanoma</td>
<td>236</td>
<td>43.2</td>
<td>0</td>
<td>3.4</td>
<td>36.9</td>
<td>2.1</td>
<td>6.8</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Thyroid</td>
<td>208</td>
<td>76.4</td>
<td>0</td>
<td>0</td>
<td>5.8</td>
<td>1.4</td>
<td>4.3</td>
<td>12.0</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>176</td>
<td>13.1</td>
<td>0.6</td>
<td>1.7</td>
<td>27.8</td>
<td>44.9</td>
<td>2.3</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>155</td>
<td>0</td>
<td>0</td>
<td>1.9</td>
<td>7.7</td>
<td>15.5</td>
<td>2.6</td>
<td>72.3</td>
<td></td>
</tr>
</tbody>
</table>

Foreword

Key studies:
Clinical decision support
Clinical trials
Genomics
Real world data
Bibliography

Five categories of biomarker evidence in 366 genes were validated against 2847 TCGA samples of advanced tumors. Watson for Genomics was used for variant categorization and annotation.
Association of mutational profile and human papillomavirus status in patients with head and neck squamous cell carcinoma (HNSCC)

Doerstling S et al. AMP 2019.

Link to study →

Tumor mutational profile findings complimented previous studies and provide potential therapeutic target areas for future research.

**Findings**

Mutations within TP53 and the p16/CDK/Rb pathway were more common in p16-negative tumors (non-HPV).

RAS pathway mutations occurred exclusively in p16-positive HPV tumors.

FBXW7 mutations were observed only in p16-positive HPV tumors, with borderline statistical significance.

The increasing incidence of head and neck squamous cell carcinoma (HNSCC) is thought to be associated with increased rates of human papillomavirus (HPV) infection. In addition, individuals with HPV+ tumors have different recovery trajectories. Study sought to further explore these associations by examining differences in mutational profiles between HPV+ and HPV- tumors.
Real world data
Disparities in receipt of and time to adjuvant therapy after lumpectomy

Disparities for receipt of adjuvant therapy following breast conserving therapy were observed across multiple demographic variables presenting opportunities for improvements in timely care.

36,270

Analysis used IBM® MarketScan® claims data for 36,270 privately insured patients with breast cancer who had not received neoadjuvant therapy.

Patients from communities with a high proportion of these races significantly less likely to receive combination of ART and AET (P < 0.001)

<table>
<thead>
<tr>
<th>Race</th>
<th>Relative Risk Ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>0.14</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Asian</td>
<td>0.13</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.45</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Associations with longer median time to treatment for ART

- HIV/AIDS + 11 days (P = 0.01)
- HIV/AIDS and residing in a highly concentrated Black community + 8.5 days (P = 0.01)
- HIV/AIDS and residing in a high-density Asian community + 12.2 days (P = 0.04)

Associations with longer median time to treatment for ACT

- Cerebrovascular disease + 6.0 days (P < 0.001)
- Moderate to severe liver disease + 8.5 days (P < 0.001)
- High-density Asian community + 18.0 days (P < 0.001)

In women with breast cancer, initiation of adjuvant treatment following breast conserving therapy (BCS) lacks consistency. After controlling for sociodemographic covariates, factors associated with time to treatment (TTT) and relative risk ratio (RR) for post-BSC adjuvant therapy were evaluated for adjuvant radiation therapy (ART), adjuvant cytotoxic chemotherapy (ACT), adjuvant endocrine therapy (AET).
Complete human papillomavirus vaccination coverage over a 13 year period in a large population of privately insured US patients

Although it increased over time, complete vaccination coverage for human papillomavirus (HPV) did not meet the Healthy People 2020 goal in the population studied. This analysis identified gaps in vaccination coverage that varied by health plan type and region, which may have policy and practice implications.

Despite the Healthy People 2020 goal of 80% vaccination coverage for HPV, vaccination rates are low in the US, especially in adolescents. Variability in defining measures of vaccination in published studies may contribute.

This analysis aimed to examine complete vaccination in a privately insured US population over a 13 year period.
Biomarker testing patterns and trends among patients with metastatic lung cancer


The likelihood of biomarker metastatic lung testing varied with several factors such as age, insurance plan type, sex and comorbidities highlighting opportunities to inform outreach policy for underserved populations.

12% of the 8,977 patients with metastatic lung cancer had claims for biomarker testing between 1/1/2013 – 12/31/2018

20.6% of patients were tested in 2018, a significant increase from 8.4% in 2013 (P < 0.0001)

Factors associated with a lower likelihood of testing included:

→ Increasing age
→ Enrollment in a preferred provider health plan
→ Pre-existing diabetes or congestive heart failure

Factors associated with a higher likelihood of testing included:

→ Age under 55
→ Females
→ Residence in Northeastern US

Biomarker testing in patients with metastatic lung cancer can aid oncologists in making targeted treatment decisions. This analysis assessed sociodemographic factors related to testing in a commercially insured population in the IBM® MarketScan® database.
Bibliography

For insight into the scientific evidence of Watson Health Oncology, please reference these additional publications.

a tool to standardize and improve the quality of a cancer care in Sub-Saharan Africa, at Ocean Road Cancer Institute in Tanzania. J Clin Oncol. 2020;38 (suppl; abstr e14070).


79. Somachekhar SP, Yethadka R, Rohit Kumar C, Rajopadhyak SP, Rauthan A, Patil P. Triple blinded prospective study assessing the impact of genomics: EndoPredict and artificial intelligence Watson for Oncology (WFO) on MDT’s decision of adjuvant systemic therapy for hormone receptor positive early breast carcinoma. J Clin Oncol. 2019;37 (suppl); e18013.


86. Suwanvecho S, Suwanrusme H, Issarachai S, et al. Concordance between a clinical decision-support system and treatments selected by clinicians as a function of cancer type or stage. Journal of Global Oncology. 2019; 5 (Supplement);95.


