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Cancer Healthcare Utilization Impact of Precision Therapeutics: Hospitalization/Emergency Visits

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ABSTRACT

Recent advances in comprehensive genomic profiling (CGP) has enabled the detection of actionable mutations with corresponding molecular targeted therapy, both rapidly and accurately. While the cost of CGP has declined, it is still unknown how CGP through use of targeted precision therapy effects health care costs. We present evidence for use of CGP in advanced cancer management and corresponding precision therapy to reduce total healthcare utilization.

Keywords

Cancer, Genomic profiling, Healthcare, Precision therapy.

Introduction

Precision therapy is rapidly expanding standard of care for advanced cancer in patients with a relevant molecular signal or immune profile [1]. This particularly may affect later stage cancer patients who have exhausted standard of care options [2]. Routine use of CGP is now standard of care for patients with advanced cancer. Use of CGP companion diagnostics have demonstrated statistically significant benefit in overall survival, relapse free survival and progression free survival involving precision therapy [3-11]. Moreover, fewer toxic deaths [12], cost effective health management [3-5,11,13] and better health outcomes have been suggested [3].

Recent retrospective analysis of nearly 30,000 advanced cancer patients undergoing CGP testing and receiving target directed precision therapy via FoundationOne (Foundation Medicine, Boston USA) assessment revealed 7.2 month overall survival advantage compared to patients who did not undergo CGP testing and/or received non-targeted systemic treatment [16]. Similarly, immune response directed precision therapy mostly related to use of checkpoint inhibitors provided overall survival advantage of 8.5 months [14].

Results

Given advantage of CGP testing to guide optimal cancer treatment, we expanded our use of CGP testing towards routine assessment with FoundationOne CDx for new therapy consideration of advanced cancer patients on January 1, 2018. We compiled objective healthcare utilization evidence retrospectively including days of hospitalization and emergency room visits from January 1, 2017 to December 31, 2017 prior to routine molecular profiling and compared to January 1, 2018 through August 15, 2018 time period after establishing use of molecular profiling with FoundationOne CDx testing in similar advanced late stage cancer patients. Retrospective analysis was done using consecutive patient medical records following site Institutional Review Board (IRB) approval.

A total of 218 consecutive adult (≥ age 18) patients with advanced cancer who received systemic therapy had records reviewed; 97 patients in 2017 and 86 in 2018 (35 patient records were excluded from analysis for incomplete emergency visit and/or hospitalization information). No difference in demographics such as age, sex, race, comorbidities (congestive heart failure, hypertension, diabetes, COPD, or chronic kidney disease), type of cancer (stage) or performance level was observed. Nineteen out of 97 (20%) of patients received precision therapy related to CGP testing in 2017 and 26 of 86 (30%) received precision therapy in 2018 (3 patients received combination precision therapy and chemotherapy and were included in the precision therapy group).

Review of precision therapy group analysis vs. non-precision therapy from January 1, 2017 to August 15, 2018 suggested a reduction in the average number of days hospitalized per hospital stay per patient admitted in the precision therapy group compared to non-precision therapy treated patients (3.36 (1-19) days vs. 4.7 (1-34) days, respectively). Furthermore, toxic events accessed as emergency room visits and acute hospitalization events, identified as "total healthcare usage" revealed 35 events occurred in the 45 precision therapy patients and 133 events occurred in the 138 patients in the non-precision therapy treatment group. Fisher exact analysis supported this as a significant difference (p=0.0004). Breakdown of total healthcare usage parameters are shown in Table 1.

	Precision Therapy (%)	Non-Precision Therapy (%)
Total patients	45	138
Patients with ER visits	8 (18)	32 (23)
Patients hospitalized	14 (31)	61 (44)
Number of ER visits	10 (22)	47 (33)
Number of hospitalization events	25 (56)	86 (62)

Table 1: Precision vs. non-precision therapy total healthcare usage analysis.

Discussion

These results serve as proof of principal support and justify further studies and large population analysis of healthcare utilization impact with respect to CGP testing to guide precision therapy decisions. Routine use of CGP testing, which is necessary for therapeutic guidance, can be compared to healthcare utilization involving breast cancer screening with mammography in terms of relationships to clinical benefit and cost. Screening with mammography of women between ages 50-69 every 2 years, has been shown to prevent one breast cancer death for every 5-9 women screened [15,16]. Cost to payer is $11.40 per client per year [17]. Whereas, CGP screening of advanced cancer patients with non-small cell lung cancer done one time with corresponding utilization of precision therapy in management revealed similar prevention of death for 1 out of 5 per CGP tested patients. Cost to payer was considerably less than mammography at $0.20 per client per year [18].

A proportion of patients at our cancer center were also able to expand treatment options based on CGP guidance of precision therapy. Reitsma et al. [19] suggested further savings involved with experimental trial opportunity utilizing CGP signal guidance and precision drug cost transferred to sponsor. Although verification of activity to the experimental precision therapy is not validated. Haslem et al. [4] published a retrospective analysis of precision therapy outcomes in community managed cancer patients without other standard of care options and showed correlated progression free survival (PFS) improvement (22.9 weeks vs. 12 weeks $p < 0.002$). This approach would not be recommended in patients with early stage disease or for those with an NCCN guideline directed therapy option. However, those patients with relevant targeted clinical trial and/or palliative management options would be a consideration. Over the next 5 years, given lower toxicity profile of precision therapeutics, use will likely be expanded to enable earlier stage of disease treatment. Signorovitch [6] et al. and Chawla [3] et al. found CGP testing as cost effective when performed early in advanced cancer diagnosis.

Conclusion

In conclusion, extensive cancer patient clinical benefit has been demonstrated in numerous trials involving CGP testing directed precision therapeutics leading to FDA registration of over 100 novel precision therapeutics when based on comparison to standard non-systemic therapy. We believe these results add to accumulating evidence that routine use of CGP for cancer care management and corresponding precision therapy will reduce healthcare cost.

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