Healthcare Resource Utilization and Costs in Metastatic Pancreatic Cancer: A Systematic Literature Review

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INTRODUCTION

- Metastatic pancreatic cancer (mPaC) accounts for 432,242 deaths worldwide per year (5% of all cancer deaths); its estimated 5-year survival rate is only 9%.[1,2]
- The high mortality rate and poor prognosis is mainly due to diagnostic challenges at earlier stages and the aggressive nature of this cancer.[2]
- Due to high costs of healthcare utilization in mPAC, a global assessment of disease impact and economic burden is warranted to understand cost-related patterns.

OBJECTIVES

- To identify healthcare resource utilization (HCRU) and costs associated with management of mPaC.

METHODS

- A systematic literature review of databases (2008–2019), relevant cancer registries (2019), and conference abstracts (2015–2019) was undertaken to identify articles on the economic burden of mPaC.
- All records retrieved were screened against the predefined eligibility criteria in **Table 1**.
- Data collection and extraction into descriptive format was undertaken by a single reviewer with validation by a second, independent reviewer.
- The methodology was performed in accordance with published guidance.[3,4]
- A web-based tool[5] was used to adjust costs to US$ 2019 values using International Monetary Fund rates.

Table 1. PICOS Screening Criteria

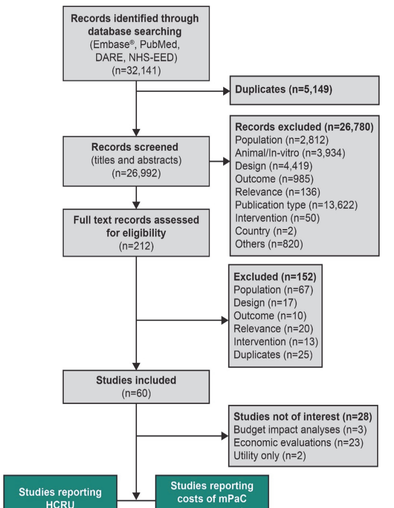
	Inclusion Criteria
Population(s)	Adults (>18 years) Confirmed diagnosis of mPaC
Interventions	Olaparib, niraparib, rucaparib, veliparib, FOLFIRINOX, FOLFOX, cisplatin, carboplatin, docetaxel, etoposide, everolimus, temozolomide, doxorubicin, cyclophosphamide, interferon, pegylated interferon, S-1, ABT-888, capecitabine, erlotinib, 5-fluorouracil, gemcitabine, irinotecan, leucovorin, nab-paclitaxel, nanoliposomal irinotecan, irinotecan hydrochloride, oxaliplatin
Comparisons	No restrictions
Outcomes	Hospital admission, length of stay, ER visits, physician visits, pharmacy costs, quality-adjusted life years, incremental cost-effectiveness ratio, budget impact
Study design	Cost-effectiveness analyses, cost-utility analysis, budget-impact models, cost-of-illness studies, resource use studies

ER, emergency room; FOLFIRINOX, fluorouracil, leucovorin, irinotecan and oxaliplatin; FOLFOX, folinic acid, fluorouracil and oxaliplatin; GEM, gemcitabine; PICOS, population(s), intervention, comparator, outcomes, study design.

RESULTS

- Thirteen studies reporting HCRU and 19 studies reporting costs of mPaC management were included in the final analysis (**Figure 1**).

Figure 1. PRISMA Flow Chart



RESULTS

Table 2. HCRU in Patients with mPaC

Reference	Country	Analysis	Patients (n)	Key Findings
HCRU				
6	USA	Retrospective analysis[a]	4,938	Hospitalizations (84%) and ER visits (73%) were high; total treatment cost (see **Table 3**) was mainly related to inpatient stays (58%) and outpatient visits (35%)
7	Portugal	Retrospective analysis	66	Most patients (68%) were hospitalized and mean length of stay was 12 days
8	France / UK	Retrospective analysis	400	Hospitalizations were reported in 54% of patients (51% [UK] and 58% [France]); the mean length of stay was 11.7 days [7.7 [UK] and 15.3 [France] days). ER visits were reported in 37% of patients (29% [UK] and 45% [France])
9	USA	Nationwide inpatient analysis	60,140	Hospital stay was significantly longer for obese (adjusted mean difference: 1.2 days; *P*<0.01) and morbidly obese (1.8 days; *P*<0.01) mPaC patients compared with non-obese patients. However, palliative care utilization was not significantly different
10	USA	Retrospective analysis[a]	72,205	Mean number of ER visits (0.9 vs 0.8; *P*<0.001) and cost of care (US$1,317 vs US$842; *P*<0.001) was significantly higher in patients receiving palliative care versus no palliative care in the last 30 days of life
Comparative HCRU				
11	USA	Retrospective analysis	345	FOLFIRINOX was associated with higher rates of hospitalization (37% vs 25%; *P*=0.273) and duration of hospitalization (3.6 vs 1.7 days; *P*<0.01) than nab-P/GEM
12	USA	Retrospective analysis	470	FOLFIRINOX was associated with greater use of supportive care (95% vs 87%; *P*=0.002) and associated costs (US$3,955 vs US$1,836; *P*<0.0001) than nab-P/GEM
13	USA	Retrospective analysis	3,825	Chemotherapy was associated with increased rates of hospitalizations (45% vs 30%; *P*<0.001) and ER visits (41% vs 27%; *P*<0.001) in the last 30 days of life vs no chemotherapy. Chemotherapy was also associated with a 28% increase in mean Medicare payment (from US$14,033–US$17,960; *P*<0.001) during this period

Nab-P/GEM, nab-paclitaxel and gemcitabine. [a]Medicare database.

Table 3. General Costs Associated with mPaC

Reference	Type of Cost	Cost Year	Cost in US$ (2019)
14	Expected cost of managing mPaC	2012[a]	43,526
15	Average overall cost of Stage IV PC	2017	64,301
16	Monthly treatment cost of mPaC	2009	14,037
16	Estimated remaining lifetime treatment cost mPaC	2009	22,366
6	Mean cost per month of treating mPaC	2006[a]	20,197
6	Cost of inpatient stay	2006[a]	11,714
6	Cost of outpatient visits	2006[a]	7,069
17	Total monthly costs	2012	10,648–13,529
18	Total annual healthcare costs per patient	2011[a]	76,320
18	Inpatient cost	2011[a]	24,675
18	Outpatient cost	2011[a]	26,191
9	Total hospitalization charges	2016[a]	14,245 (obese); 21,770 (morbidly obese)[b]

[a]Cost year used for calculation was mid-value of data collection period. [b]Mean difference versus non-obese.

Table 4. First-line Treatment Costs Associated With mPaC (Converted to US$ 2019)

Regimen	Total Medical Cost[a]	Total Cost of Medical Care[b]	Treatment Cost	Supportive Care Costs[c]	Administration Costs	Inpatient Costs	Outpatient Costs
First-line therapy (mean ± SD), range, number of studies contributing to each value							
Nab-P/GEM	20,814 ± 4,146 18,018–25,578 n=3	72,834 n=1	11,944 ± 1,880 8690–13,242 n=5	2,212 ± 523 1,689–3,924 n=4	1,167 ± 610 566–2,014 n=4	1,751 n=1	1,436 ± 757 900–1,971 n=2
FOLFIRINOX	23,206 ± 4,986 19,219–28,796 n=3	50,167 n=1	6,949 ± 2,602 3,155–10,363 n=5	6,083 ± 1,724 4,443–8,049 n=4	2,055 ± 1,391 575–3,267 n=4	3,560 n=1	1,828 ± 455 1,506–2,150 n=2
GEM	–	5,464 n=1	886 ± 836 295–1,477 n=2	–	155 n=1	–	–
GEM-ERL	–	55,267 n=1	8,750 ± 104 8,676–8,824 n=2	–	155 n=1	–	–

AE, adverse event; GEM-ERL, gemcitabine and erlotinib; SD, standard deviation.
[a]Inpatient and outpatient costs; [b]Obtained by multiplying median progression-free survival by total monthly cost; [c]Medications to prevent/treat AEs.

HCRU Drivers

- Most studies showed that patients with mPaC had high hospitalizations (up to 84%), with a long duration of stay (up to 12 days), and most also required frequent ER visits (up to 73%) (**Table 2**).
- Hospitalization rates and use of supportive care were affected by treatment choice (**Table 2**).
- Obesity and chemotherapy use were associated with significantly increased HCRU (**Table 2**).

Cost Burden

- Total monthly costs for managing mPaC ranged from US$10,648–20,197, with an annual healthcare cost of US$76,320 per patient (**Table 3**).
- Hospitalization (mainly inpatient stay) was a key cost driver, ranging from US$11,714–24,675 (**Table 3**).
- Total medical cost per patient per month for first-line treatment ranged from US$18,018–25,578 for nab-P/GEM and US$19,219–28,796 for FOLFIRINOX (**Table 4**).
- These treatments were associated with high rates of supportive care utilization (87% and 95%, respectively) (**Table 2**) and associated costs, ranging from US$1,689–3,924 for nab-P/GEM and US$4,443–8,049 for FOLFIRINOX (**Table 4**).
- First-line treatments were also associated with high administration costs, ranging from US$566–2,014 for nab-P/GEM and US$575–3,267 for FOLFIRINOX (**Table 4**).

LIMITATIONS

- Comparisons were difficult due to study heterogeneity and limited studies in the metastatic setting. Results were descriptive only, and may not be generalizable.

CONCLUSIONS

- mPaC and current first-line treatments were associated with frequent hospitalizations and ER visits.
- Furthermore, nab-P/GEM and FOLFIRINOX were associated with high treatment costs, including administration and supportive care costs.
- No studies identified costs specifically in gBRCA mPaC patients; this remains a key area for further evaluation.

Disclosures

SJ, DM, ASK, PE are employees of Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Kenilworth, NJ, USA (MSD). SA and HKY are employees of AstraZeneca. SK and SS are employees of Parexel. This work was funded by MSD and AstraZeneca.

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