Technical Document: Detailed Instructions for Conducting the Opportunity Analysis and Using the Supportive Care Calculator

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Background

Many hospitals struggle to develop internal data describing the need for clinic-based palliative care and the expected impacts of such services. The Opportunity Analysis for Outpatient Palliative Care (Opportunity Analysis, or OA) was designed to help fill this gap. It is used in conjunction with spreadsheets provided in the accompanying Supportive Care Calculator. Alternative approaches that are less data-intensive are also available in *Palliative Care Clinics: Evaluating Opportunities and Projecting Possible Fiscal Impact*.

Resources Required

The methods proposed here should be within the skill set of advanced fiscal analysts using hospital billing and administrative data for complex analyses. The estimated time for completing all steps is 150–300 hours. Within each set of steps, however, "lite" approaches that achieve some of the goal but require less work are described. The amount of work you put into planning and analyses should be driven by the expectations and needs of decisionmakers in your health system.

Value of This Approach

While some steps and outputs may be skipped, the value from the full analysis includes:

- Inclusion of patients who died outside the hospital
- Careful grouping of patients into disease groups such as cancer, heart failure, and chronic obstructive pulmonary disease (COPD)
- Detailed assessment of patients' end-of-life emergency department (ED) and hospital utilization for each disease group
- Degree to which inpatient palliative care and hospice referrals are used currently, and timing of these services before death
- Month-by-month utilization details for the final six months of life, including auto-generated graphs
- Interactive calculations of potential clinic volumes and staffing costs
- Projections of possible impact on utilization and costs

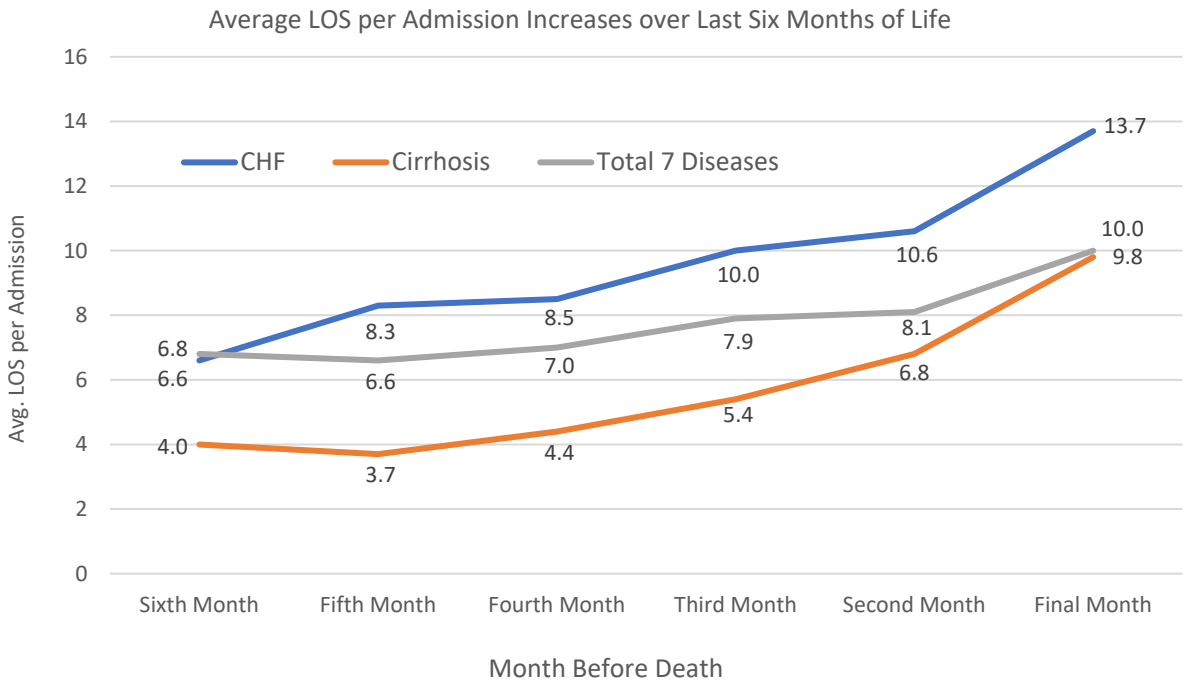
Thumbnail images of results of this analysis (using data from Virginia Commonwealth University, fiscal years 2010–12) are shown in Figures 1 and 2. In the baseline utilization analysis (Figure 1), for each disease of interest the analysis shows eight metrics of interest.

Figure 1. Sample Output of Comprehensive Analyses

Stats per Year, from Decedents' Final 6 Months	ALS/ Dementia	Cancer	Heart Failure	Cirrhosis / Liver Failure	COPD	Kidney Disease
Unique Patients Dying	76	992	166	158	72	99
Deaths in Hospital	6	187	54	50	15	23
ED Visits	38	770	234	179	97	107
Hospital Admissions	37	1,024	251	219	71	98
Inpatient Bed Days	314	8,480	2,756	1,605	525	954
30-Day Re-admits	11	315	88	77	21	31
30-Day Mortality Admits	12	381	80	84	24	32
Avg. Health System Costs per Patient	$14,223	$31,183	$54,346	$34,061	$23,905	$36,630

Note: *ALS* is amyotrophic lateral sclerosis; *COPD* is chronic obstructive pulmonary disease; *ED* is emergency department
Source: Author summary of Virginia Commonwealth University data, fiscal years 2010–12.

Figure 2. Sample Output of Month-by-Month Changes in Utilization



Note: *CHF* is congestive heart failure; *LOS* is length of stay.
Source: Author summary of Virginia Commonwealth University data, fiscal years 2010–12.

Figures 1 and 2 are just two samples of the many kinds of information and insights you can obtain through comprehensive analyses. A full list of outputs is presented in Appendix A.

Approach

Briefly, the comprehensive analysis approach includes these steps:

1. Acquiring, assembling, and preparing the data.
2. Conducting analyses to depict the baseline or "current state" of serious illness patients' use of selected health services.
3. Putting those findings into tables (OA Tables 1 & 2, Excel files provided in this resource set).
4. Using the interactive Supportive Care Calculator (Excel file provided in this resource set) to project possible patient volumes, visits, staffing costs, and potential impact on costs and patient use of health care services.

Hospitals with active palliative care clinics can contrast patterns and outcomes for patients who did and did not access the PC clinics, or can look for differences in outcomes relative to timing of initial PC clinic contact (early vs. late in the disease course).

Patient Population

The OA focuses on patients with six chronic, life-limiting diseases: cancer, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), end-stage renal disease (ESRD), neurological conditions (including dementia), and cirrhosis / liver failure. Analysts also have the option to identify and include other conditions, such as advanced cardiovascular or neurovascular disease. A subset of these disease groups, or all of them, can be used as appropriate for a given hospital. A list of ICD-10 diagnosis codes that can be used to construct the six disease groups is available in Appendix B.

Data Sources

The analysis uses three types of data:

1. **Data that identify a population of decedents.** Palliative care clinics would normally see patients with advanced stages of disease. Because current stage of disease is difficult to infer from billing data, the OA starts with identifying patients with the target diseases who are known to be dead, and then evaluates their patterns of care in the months before death. Unfortunately, that step is also difficult; hospital billing/administrative data do not capture when patients die outside of that hospital, and most patients do not die in hospitals. Death data are available from a few sources, including the Social Security Administration's Death Master File (DMF), death records maintained by state or county public health offices, or for cancer patients only, data from a hospital cancer registry. These data are needed to identify decedents and date of death.

   Comprehensive external sources of death data are preferred to avoid bias related to including only the subset of the population that died in your hospital. However, internal sources such as a hospital-based cancer registry can be used if it includes information on deaths outside the hospital.

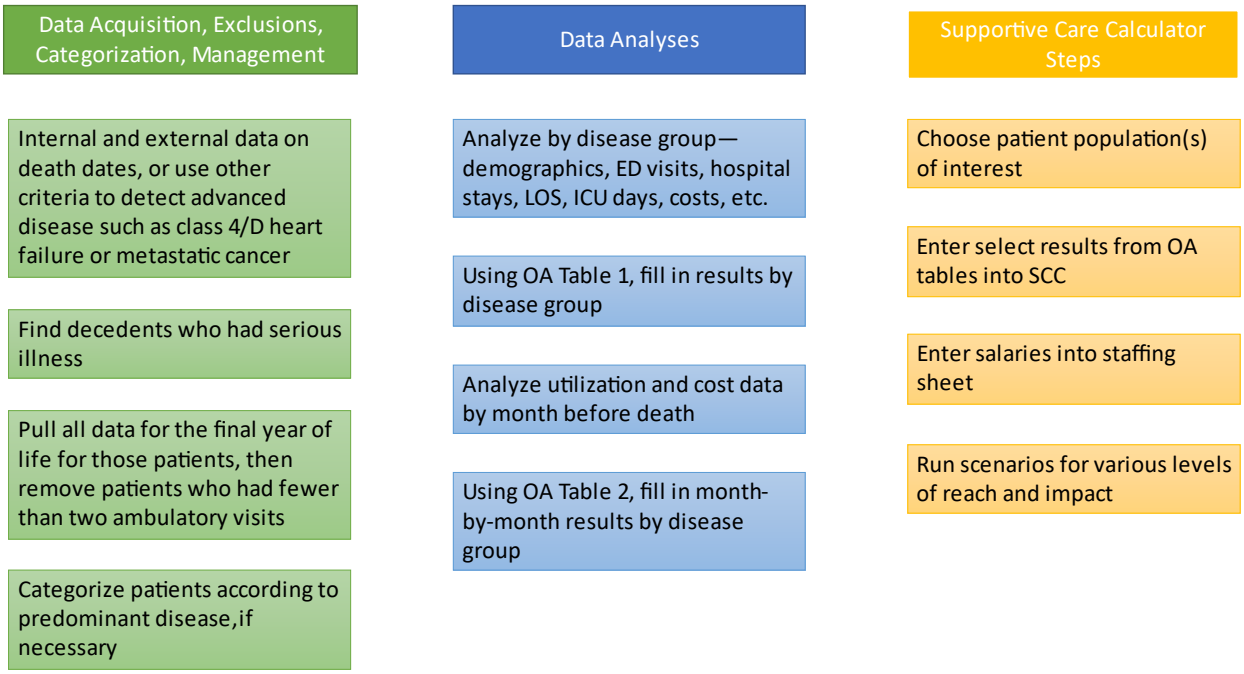
2. **Billing/administrative data.** These include data describing your patients (age, primary payer, diagnoses), and data describing contacts with your health system, which are needed to assess utilization and fiscal outcomes. The health system encounter data will at least include information describing hospital admissions and ED visits, but also might include data describing clinic visits and home health or hospice services, depending on the scope of services offered by your system.

3. **Palliative care encounter data** (if the hospital has inpatient or some outpatient PC). This information is not always stored in the same data systems as the general billing/administrative data for the hospital. These data are needed to identify use of existing palliative care services, including the interval between first contact with palliative care service and death.

Step-by-Step Methods

Steps from start to end are shown in Figure 3.

Figure 3. Major Steps



Note: *ED* is emergency department; *LOS* is length of stay; *ICU* is intensive care unit; *OA* is opportunity analysis; *SCC* is Supportive Care Calculator.
Source: Developed by authors.

A. Acquire, Integrate, and Harmonize External Death Data

1. Determine whether the hospital is already acquiring death data from an external source.
2. If not, or if limited to the federal Social Security data (which are heavily redacted), advocate for obtaining state death data. In California, the Public Use Death Data File is available free from the California Department of Public Health at https://www.cdph.ca.gov/Programs/CHSI/Pages/Data-Applications.aspx. The application for access is brief and can be submitted electronically. In addition to date of death, the file includes data that can be used to match with hospital data, including first, middle, and last name; sex; date of birth; place of birth; place of death; and father's last name.
3. Once the death data are obtained, they need to be brought into the same platform as the other hospital data, and then matched to the hospital data at the patient level. For that process, a variety of criteria can be used, some more stringent than others. For example, “exact last name” AND “exact first name” AND “exact date of birth” will be more stringent than “exact last name” AND “first initial” AND “month and year of birth.” Requiring an exact match on multiple variables may reduce the number of records available to analyze (some matches may be missed if, for example, one file has just middle initial and the other has a full middle name); using a looser matching strategy can result in false matches (death record matched to wrong patient).
4. Once matched, the data from multiple sources must be harmonized. For example, patients who died in hospital and are matched to state death data will have both internal and external information on death date, and sometimes these do not match exactly. Or someone may be deceased according to

one data source but still have subsequent hospital encounters according to another (or even within the same) data source. Cases where the truth is impossible to determine from available data can be flagged and excluded from subsequent analyses.

Alternative approaches for obtaining and integrating external data on deaths:

- Use a patient registry that includes deaths or dates of last follow-up, such as the cancer registry maintained by each hospital. This registry should include deaths outside of the hospital but may not be applicable to diseases other than cancer.
- Conduct a small-scale version of the approach described above focusing on former patients (no longer using care) randomly selected from your hospital data, and manually ascertain which ones died and the dates of death for those who died outside the hospital. This may entail using obituaries and other public notices of death, information from local hospices if available, and potentially information from the medical examiner's office or department of health. Aim to identify at least 50 patients for whom you can ascertain vital status and date of death. (This is similar to what cancer registrars do.) Use those 50 cases as your analysis population.

B. Identify Decedents Who Had at Least Two Ambulatory Visits in the Six Months Before Death

These visits can include home visits or televisits if relevant.

1. Create a table of unique Medical Record Numbers (MRNs) of now-deceased patients who used your health system in your selected analysis period.
    - At this point, the analysis can be limited to adults if the outpatient palliative care will be limited to adults.
    - Similarly, for a palliative care clinic limited to one disease (e.g., cancer), the analyses can be limited to that disease group at this time.
2. For each person, tally the number of outpatient encounters they had in the approximately six months before death.
3. Exclude from subsequent analyses those who had zero or only one ambulatory visit, because your assessment of current and future state is focused on patients using your health system for ambulatory care who will be referred to outpatient palliative care.

Alternative approaches: This step is not burdensome, so no alternatives are provided.

C. Categorize Patients by Predominant Disease

Often, palliative care programs develop expertise in a specific disease group or two — such as cancer and heart failure — and consequently have good working relationships with those referring provider groups (e.g., oncologists and cardiologists). Similarly, some palliative care clinics are disease-specific and often colocated with the disease specialists. Consistent with such thinking, this step in the methods provides a way to categorize patients by disease group.

The ICD-10 codes for each disease are provided in Appendix B. For those planning a single clinic for one disease, use these codes to capture those patients. If you are planning one clinic that will serve a mix of patients, you can just use all the appropriate codes together and not separate patients by disease

group — for example, a cardiopulmonary PC clinic could include a mix of patients with either heart failure or COPD, or both.

Many patients have multiple serious illnesses. If you are planning separate clinics for different disease groups (e.g., one PC clinic for cancer and a separate PC clinic for heart failure), you can do the full analysis separately on each population, or you can follow the method below to do the analysis just once, and for those with multiple conditions, determine which one is predominant based on cumulative charges.

The detailed steps that follow are for those who want to produce results simultaneously for multiple disease groups, where each patient can be in one disease group only.

1. First focus only on the primary diagnosis for each claim (often labeled DXP in billing data). For each encounter, indicate which (if any) of the target diseases is present in the primary diagnosis position.
    a) In the encounter-level data, create new variables for each target disease — this will be a one-digit "flag" field, 0 or 1.
    b) Assign the value 1 if an ICD-10 matches a diagnosis code: cancer (CA) = 1, heart failure (HF) = 0, COPD = 0, and so on). These are mutually exclusive: each claim has only one primary diagnosis. The ICD-10 codes for each target disease are in Appendix B. If other diseases are of interest, such as cardiovascular or neurovascular, similar lists would need to be developed.
2. In the patient-level data, sum the billed charges flagged for each disease.
    a) In the patient-level data, create a new variable for each target disease — this will be a numeric field with a width of at least 12, including two decimals.
    b) Across the encounters for each person, sum the charges that were flagged for each disease: CA = $95,437, CHF = $0, COPD = $13,987, etc. Many patients will have multiple target diseases with charges, and many other patients will have $0 for all the target diseases.
3. Categorize each patient with a predominant disease based on the target disease with the greatest sum of charges. For each person, create a new field for predominant disease in the patient-level data. Use a series of if-then statements or similar programming to assign a category to each patient based on the disease with the highest cumulative charges.
    - For this step, ignore the charges incurred for all non-target diseases (diabetes, flu, etc.).
    - For all those who had $0 for all the target diseases, label them with "Other" or "None" or similar.

    For example, a patient who had $123,098 in cancer charges and lesser amounts for all other target diseases would be categorized as "Cancer." See Figure 4 for more examples.

Figure 4. Hypothetical Patient-Level Categorization with Predominant Disease

MRN	Cancer Charges	Heart Failure Charges	COPD Charges	Kidney Failure Charges	Cirrhosis Charges	Neuro Charges	All Other Charges	Predominant Disease Group
100012	0	$35,250	0	$50,000	0	0	0	Kidney
432154	0	0	$1,050	0	$1,000	0	0	COPD
987789	$1,650	0	$1,025	0	0	0	0	Cancer
632547	0	0	0	0	0	0	$15,000	Other

Source: Developed by authors.

4. Optionally, for those patients with $0 in charges for the six target diseases across all of their encounters using the primary diagnosis (labeled as "Other" in the figure), the above steps can be repeated for the first secondary diagnosis (often labeled DX1), second secondary diagnosis (DX2), third secondary diagnosis (DX3), etc. This will capture patients whose primary diagnosis was, for example, always diabetes and for whom cancer was always secondary on their encounters.

To reiterate the value of Step C. Step C takes some time to complete, especially if delving below the primary diagnosis level, and this may feel like being too far "into the weeds." But Step C is imperative for those planning multiple disease-specific clinics because patients often have more than one disease. To avoid double-counting those patients in "current state" analyses and double-counting their projected outcomes in the future state, Step C forces multi-morbid patients into a predominant disease group even if they actually have more than one condition.

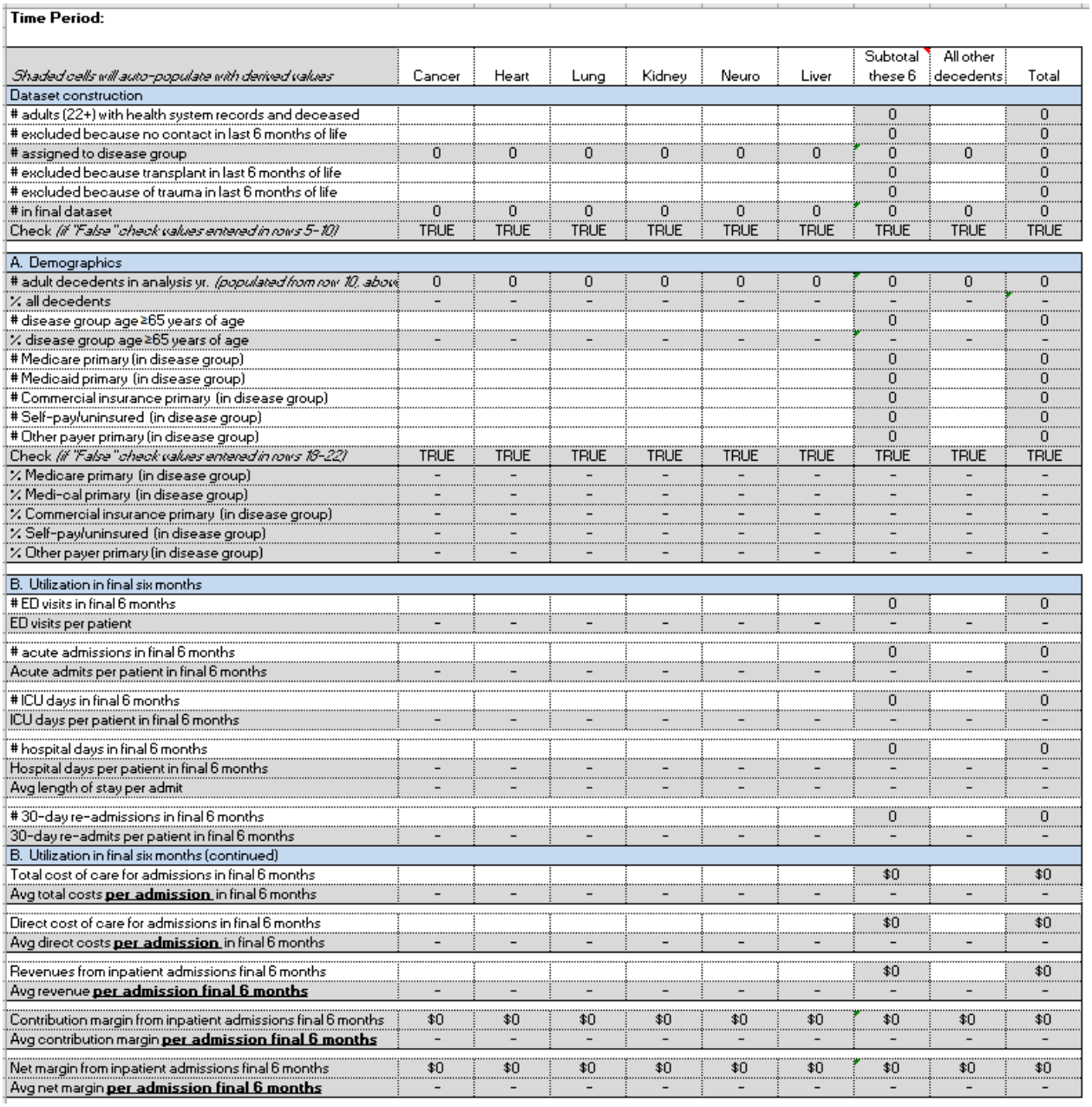
Alternative approaches:

- Plan only one PC clinic at a time, and analyze the data only for the disease of interest.
- An alternative to using ICD-10 codes as the basis for disease categorization would be to use medical specialty for ambulatory visits as the basis — that is, patients treated mostly by oncologists, even if they also have some other conditions, would be assigned to the cancer group.

D. Using OA Table 1 as a Guide, Analyze Data

Summarize patient-level information such as demographics, utilization in the final six months of life, utilization in the final month of life, and use of hospice and palliative care, by disease group. OA Table 1 is an Excel file with five sections and includes its own instructions page. A thumbnail image of the first two sections of that table is shown in Figure 5.

Figure 4. Image of Top Portion of OA Table 1



Time Period:

Shaded cells will auto-populate with derived values	Cancer	Heart	Lung	Kidney	Neuro	Liver	Subtotal these 6	All other decedents	Total
Dataset construction									
# adults (22+) with health system records and deceased							0		0
# excluded because no contact in last 6 months of life							0		0
# assigned to disease group	0	0	0	0	0	0	0	0	0
# excluded because transplant in last 6 months of life							0		0
# excluded because of trauma in last 6 months of life							0		0
# in final dataset	0	0	0	0	0	0	0	0	0
Check *(if "False" check values entered in rows 5-10)*	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
A. Demographics									
# adult decedents in analysis yr. *(populated from row 10, above)*	0	0	0	0	0	0	0	0	0
% all decedents	-	-	-	-	-	-	-	-	-
# disease group age ≥65 years of age							0		0
% disease group age ≥65 years of age	-	-	-	-	-	-	-	-	-
# Medicare primary (in disease group)							0		0
# Medicaid primary (in disease group)							0		0
# Commercial insurance primary (in disease group)							0		0
# Self-pay/uninsured (in disease group)							0		0
# Other payer primary (in disease group)							0		0
Check *(if "False" check values entered in rows 18-22)*	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
% Medicare primary (in disease group)	-	-	-	-	-	-	-	-	-
% Medi-cal primary (in disease group)	-	-	-	-	-	-	-	-	-
% Commercial insurance primary (in disease group)	-	-	-	-	-	-	-	-	-
% Self-pay/uninsured (in disease group)	-	-	-	-	-	-	-	-	-
% Other payer primary (in disease group)	-	-	-	-	-	-	-	-	-
B. Utilization in final six months									
# ED visits in final 6 months							0		0
ED visits per patient	-	-	-	-	-	-	-	-	-
# acute admissions in final 6 months							0		0
Acute admits per patient in final 6 months	-	-	-	-	-	-	-	-	-
# ICU days in final 6 months							0		0
ICU days per patient in final 6 months	-	-	-	-	-	-	-	-	-
# hospital days in final 6 months							0		0
Hospital days per patient in final 6 months	-	-	-	-	-	-	-	-	-
Avg length of stay per admit	-	-	-	-	-	-	-	-	-
# 30-day re-admissions in final 6 months							0		0
30-day re-admits per patient in final 6 months	-	-	-	-	-	-	-	-	-
B. Utilization in final six months (continued)									
Total cost of care for admissions in final 6 months							$0		$0
Avg total costs **per admission** in final 6 months	-	-	-	-	-	-	-	-	-
Direct cost of care for admissions in final 6 months							$0		$0
Avg direct costs **per admission** in final 6 months	-	-	-	-	-	-	-	-	-
Revenues from inpatient admissions final 6 months							$0		$0
Avg revenue **per admission final 6 months**	-	-	-	-	-	-	-	-	-
Contribution margin from inpatient admissions final 6 months	$0	$0	$0	$0	$0	$0	$0	$0	$0
Avg contribution margin **per admission final 6 months**	-	-	-	-	-	-	-	-	-
Net margin from inpatient admissions final 6 months	$0	$0	$0	$0	$0	$0	$0	$0	$0
Avg net margin **per admission final 6 months**	-	-	-	-	-	-	-	-	-

Source: Opportunity Analysis (OA) Table 1, CHCF.

1. For all decedents, gather inpatient and outpatient encounter data for the analysis period plus the preceding seven months. To analyze outcomes for patients who died in calendar year 2021, include encounter data from January through December 2021, and from June through December 2020. That way, even patients who died in very early January 2021 would have at least six months of data before date of death.

2. Remove cases where patients had hospital admissions for trauma or transplant in the final six months of life, if desired, as those are clinically very different from other patients and for whom upstream ambulatory palliative care might not be possible.
3. Categorize ED visits, inpatient admissions, hospice referrals (and clinic visits and other services, if applicable) according to month before death (six months before death, five months before death, and so on).
4. Calculate intervals between hospital admissions to identify 30-day readmissions, and intervals between hospital discharge and death to identify 30-day mortality cases (those who died within 30 days of hospital discharge).
5. Generate summary values for number of ED visits, admissions, hospital days, ICU days, direct costs, total costs, and revenues, by month before death.
6. Categorize patients according to contact with palliative care services: none, inpatient only, outpatient only, both inpatient and outpatient (as appropriate for a given health system).
7. Calculate interval between initial palliative care contact, if any, and date of death.
8. Summarize outcomes for the final six months of life, and the final month of life, to populate OA Table 1 across all five sections.

Alternative approaches:

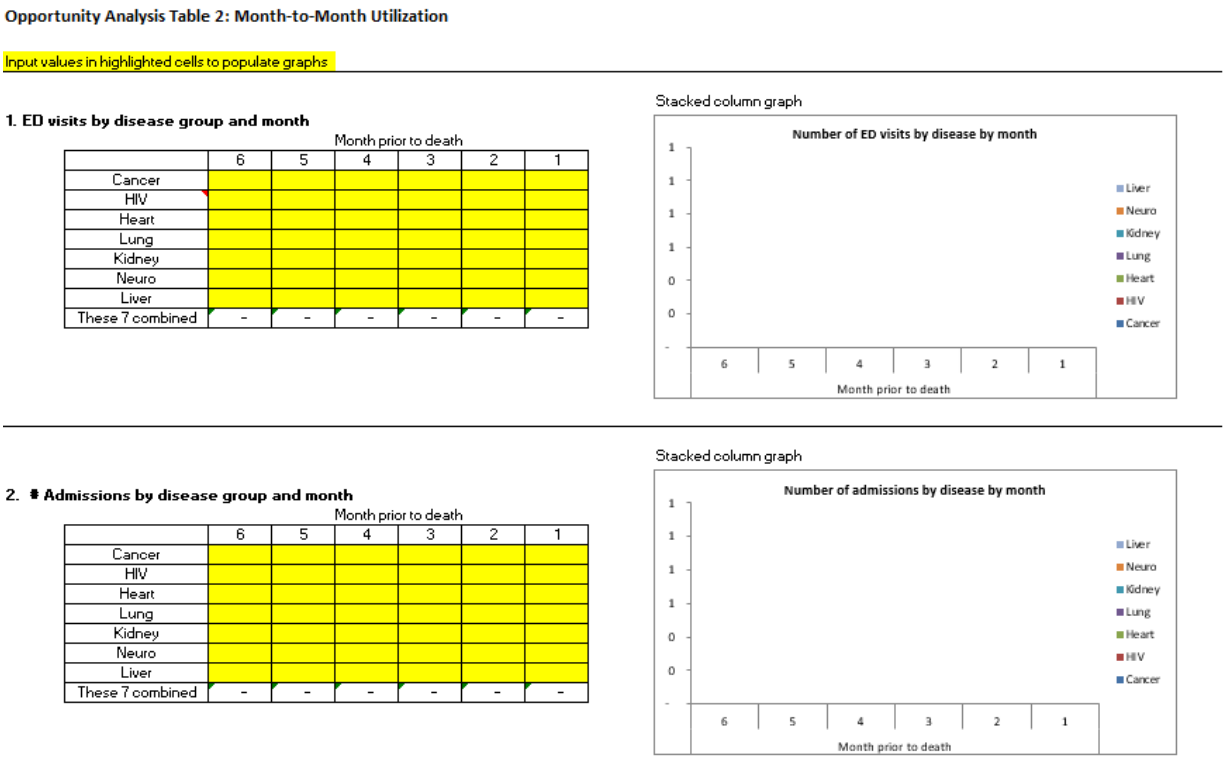
Not all rows of OA Table 1 need to be completed; you can skip metrics that are not critical for you to plan and make the case for outpatient palliative care, and you can skip fields where data are not available (revenues, for example, are difficult for many public hospitals to access).

E. Using OA Table 2 as a Guide, Analyze Data

Analyze the data by disease group month-by-month preceding death. Month-by-month analyses can help identify whether some metrics are changing over the months before death. For example, one might find that not only are the number of hospitalizations increasing over those months, but the length and cost of those hospitalizations may be increasing as well.

OA Table 2 is an Excel file with 10 tables. Filling in the input fields will automatically create the graphs that correspond to each table. A thumbnail image of the first two sections of that table is shown in Figure 6.

Figure 6. Image of Top Portion of OA Table 2



Opportunity Analysis Table 2: Month-to-Month Utilization

Input values in highlighted cells to populate graphs

1. ED visits by disease group and month

Month prior to death

	6	5	4	3	2	1
Cancer						
HIV						
Heart						
Lung						
Kidney						
Neuro						
Liver						
These 7 combined	-	-	-	-	-	-

Stacked column graph

2. # Admissions by disease group and month

Month prior to death

	6	5	4	3	2	1
Cancer						
HIV						
Heart						
Lung						
Kidney						
Neuro						
Liver						
These 7 combined	-	-	-	-	-	-

Stacked column graph

Source: Opportunity Analysis (OA) Table 2, CHCF.

If fully completed, OA Table 2 will provide tables and graphics depicting the following information:

- ED visits by disease group and month
- Admissions by disease group and month
- Average length of stay for admissions by disease group and month
- Bed days by disease group and month
- ICU days by disease group and month
- Readmissions by disease group and month
- Direct cost of care for admissions by disease group and month
- Total cost of care for admissions by disease group by month
- Contribution margin for admissions by disease group and month
- Net margin for admissions by disease group and month

The minimum data needed to complete both Opportunity Analysis tables are specified in Appendix C.

Alternative approaches:

- Most of the output from OA Table 2 is also used as input in the Supportive Care Calculator, but you may skip those that are relatively unimportant at your health system.

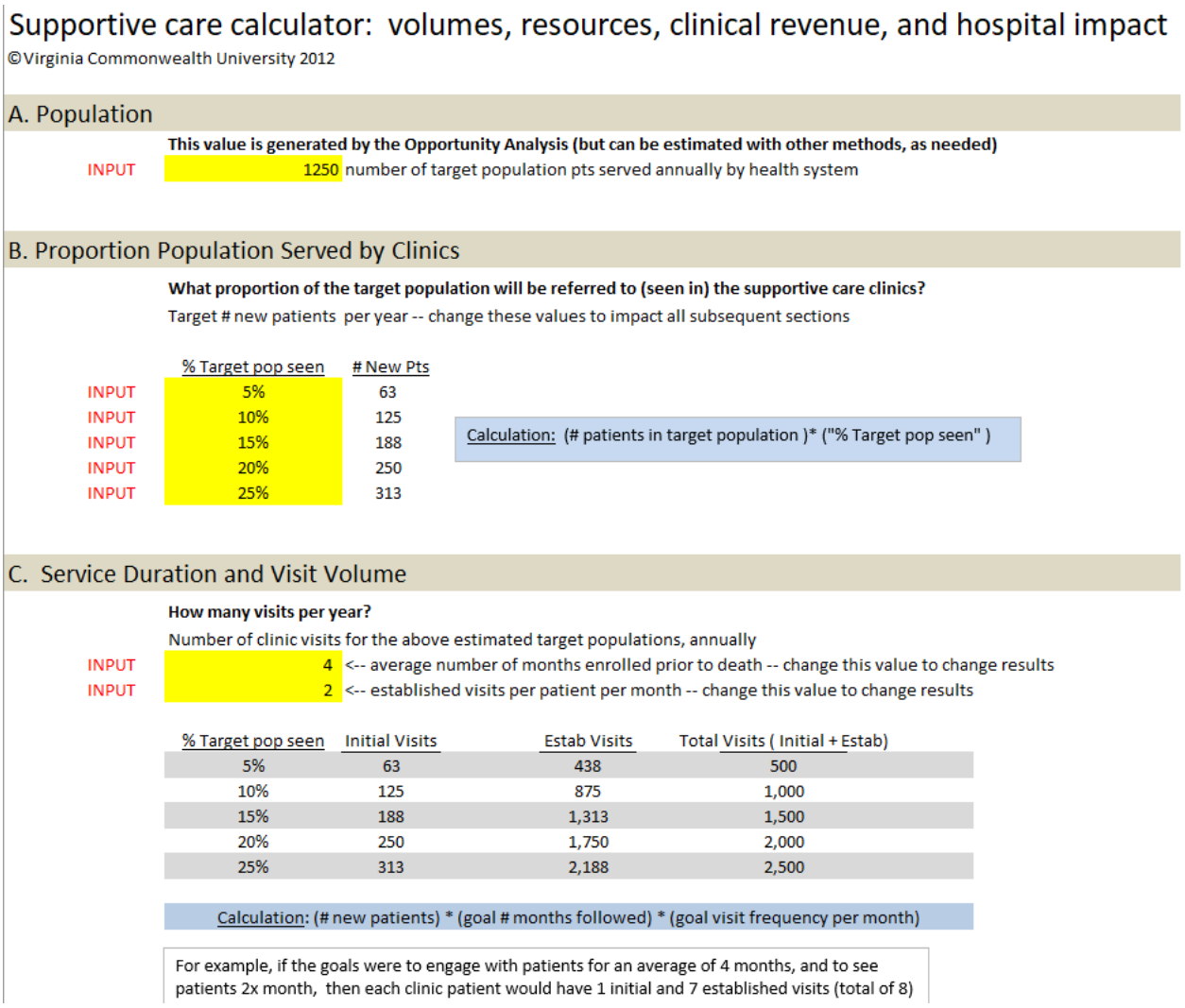
F. Enter Information into the Supportive Care Calculator (SCC)

The SCC is an Excel workbook to help answer questions such as:

- How many patients could make use of a new palliative care clinic?
- How many visits per patient should be expected?
- How many FTEs are needed to manage the expected volume?
- What will our staffing costs be?
- What revenues will be generated?
- What is the expected gap between costs and revenues?
- How will we demonstrate impact commensurate with investment and effort?

A thumbnail image of the first sections of the SCC is shown in Figure 7.

Figure 5. Image of the First Sections of the Supportive Care Calculator



Supportive care calculator: volumes, resources, clinical revenue, and hospital impact

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A. Population

This value is generated by the Opportunity Analysis (but can be estimated with other methods, as needed)

INPUT 1250 number of target population pts served annually by health system

B. Proportion Population Served by Clinics

What proportion of the target population will be referred to (seen in) the supportive care clinics?

Target # new patients per year -- change these values to impact all subsequent sections

	% Target pop seen	# New Pts
INPUT	5%	63
INPUT	10%	125
INPUT	15%	188
INPUT	20%	250
INPUT	25%	313

Calculation: (# patients in target population)* ("% Target pop seen")

C. Service Duration and Visit Volume

How many visits per year?

Number of clinic visits for the above estimated target populations, annually

INPUT 4 <-- average number of months enrolled prior to death -- change this value to change results

INPUT 2 <-- established visits per patient per month -- change this value to change results

% Target pop seen	Initial Visits	Estab Visits	Total Visits (Initial + Estab)
5%	63	438	500
10%	125	875	1,000
15%	188	1,313	1,500
20%	250	1,750	2,000
25%	313	2,188	2,500

Calculation: (# new patients) * (goal # months followed) * (goal visit frequency per month)

For example, if the goals were to engage with patients for an average of 4 months, and to see patients 2x month, then each clinic patient would have 1 initial and 7 established visits (total of 8)

Source: Supportive Care Calculator, CHCF.

To use the SCC, input data generated by the Opportunity Analysis, along with assumptions about referral patterns, length of engagement, staffing model, and billing revenues. The SCC will then generate a range of estimates regarding expected program volumes, costs, and impacts. The SCC tool has eight sections:

1. Target population (number of patients who would likely benefit from outpatient PC)
2. Proportion of population served by clinics
3. Service duration and visit volume
4. Clinic days required (for space and staffing considerations)
5. Staffing costs
6. Billing and expected revenue
7. Summary costs and revenue
8. Hospital utilization impact projections

General Notes

1. Although most analyses will be limited to the six months before death, you still need to include in your data set any encounter that closed in the last seven months of life. In some instances, utilization in the seventh month before death needs to be examined (e.g., for identifying which sixth-month admissions were 30-day readmissions from discharges in the seventh month).
2. Although the standard opportunity analysis design assesses utilization in the six months before death, you may wish to extend the analysis period to the 12–18 months preceding death, if it is the practice (or goal) at your site to engage with patients much earlier in the disease course.
3. For some systems, hospice referrals may only be documented in the "disposition at discharge" field in the claims data for hospitalizations. In such cases, be clear when presenting your data that you are *not* reporting total hospice utilization for all health system patients. Rather, you can report that "among patients referred to hospice following an acute care hospitalization, *nn* had a hospice length of service of less than three days."

Appendix A. Standard Opportunity Analysis Outputs

All of the below can be added or modified to meet site-specific needs and preferences.

Descriptive data

- Number of unique decedents per disease group
- Number and proportion of patients age <65 years, and number and proportion ≥65 years
- Payer mix — number and proportion of patients in each of four categories: Medicare, Medi-Cal, commercial, self-pay

Metrics (reported for each disease group and for all patients in all six disease groups, unless otherwise specified)

1. National Quality Forum (NQF) endorsed measures (number and proportion of patients)

- Chemotherapy in last 14 days of life (cancer patients only)
- Not referred to hospice
- First referred to hospice <3 days before death
- ICU used in last 30 days of life
- >1 ED visit in the last 30 days of life

2. Other quality metrics (number and proportion of patients)

- In-hospital deaths
- Admitted to hospital in last 30 days of life
- Median days from first hospice referral to death
- Not referred to specialist palliative care (SPC)
- First referred to SPC <30 days before death
- Median days from first SPC referral to death

3. Other patient-level analyses describing utilization and costs

- Average number of ED visits per patient in last six months
- Average number of admits and hospital days per patient in last six months
- Average number of ICU days per patient in last six months

4. Analyses at encounter level

- Average length of stay (LOS) per admit across last six months
- Number of 30-day readmits (all cause) across last six months
- Number of 30-day mortality admits across last six months (may be more than one for some patients)
- Average total and direct costs, net margin and contribution margin for hospital admissions, last six months

5. Analyses of month-to-month trends

- ED visits, by month preceding death
- Admissions, by month preceding death
- LOS per admission, by month
- Total bed days and ICU days, by month
- Readmissions by month
- Direct costs, contribution margin and net margin per admission, by month

Appendix B. ICD-10 Diagnosis Codes for Defining Disease Groups

Congestive heart failure:	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5 - I42.9, I43.x, I50.x, P29.0
Dementia:	F00.x–F03.x, F05.1, G30.x, G31.1
Chronic pulmonary disease:	I27.8, I27.9, J40.x–J47.x, J60.x–J67.x, J68.4, J70.1, J70.3
Renal disease:	I12.0, I13.1, N03.2–N03.7, N05.2–N05.7, N18.x, N19.x, N25.0, Z49.0–Z49.2, Z94.0, Z99.2
Mod/severe liver disease:	I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7
Any malignancy:	C00.x–C26.x, C30.x–C34.x, C37.x–C41.x, C43.x, C45.x–C58.x, C60.x–C76.x, C81.x–C85.x, C88.x, C90.x–C97.x
Metastatic solid tumor:	C77.x–C80.x

Codes above are from William P. Glasheen et al., "Charlson Comorbidity Index: ICD-9 Update and ICD-10 Translation," *American Health & Drug Benefits* 12, no. 4 (June/July 2019): 188–97.

Appendix C. Minimum Data Requirements for Comprehensive Version of Opportunity Analysis

Patient Data

- Date of birth
- Medical Record Number (MRN) or similar patient identifier
- Social security number (SSN), if using a death registry that includes SSN as a unique identifier
- Date of death (from health system data, cancer registry, state registry, or other source)

Specialty Palliative Care Service Contact Data

- MRN or similar patient identifier
- Specialist palliative care program encounter dates (first encounter at minimum)
- Setting or type of encounter (inpatient, clinic, home, phone or video)

Claims Data

- For hospital admissions and ED visits at minimum; data from other types of encounters, such as clinic visits or home visits, can be added per user preferences

Encounter-Level Data

- MRN
- Encounter number (unique identifier for each encounter)
- Account start date / admission date
- Account end date / discharge date
- Encounter type — ED visit, acute inpatient admission, outpatient visit, etc.
- Disposition at discharge
- Use of ED for patients admitted to the acute care hospital
- Number of bed days
- Number of ICU bed days
- Direct costs
- Total costs
- Net payment or reimbursement (may substitute expected payment if desired)
- Primary diagnosis (ICD-10 code)
- Secondary diagnoses (ICD-10 codes)
- Primary procedure (ICD-10 code)
- Secondary procedure (ICD-10 codes)

- Primary payer (classified as Medicare, Medi-Cal, commercial, or self-pay; subgroups within those four classifications can be used per site preferences)

Detailed Billing Data (needed only if tracking number of ICU days)

- MRN
- Encounter number
- Service date
- UB Code for bed type (to identify specific days in an ICU bed)