Productivity Benchmarks for Outpatient Cancer Programs

Results from a national study

Many outpatient cancer programs struggle to measure productivity and answer questions such as, how many staff members are required in a given department and how many chairs are needed in an infusion suite. Even when data are available, are benchmarking data the same for all outpatient cancer programs or are there are important differences depending on program size and other variables? In 2013 the Oncology Management Consulting Group solicited volunteer ACCC-member cancer programs to contribute data for a pilot analysis of productivity in hospital-based infusion and radiation centers. This article reports highlights of this hospital oncology benchmarking study. (The full study is available online at: http://mynetwork.accc-cancer.org.)

Methodology

Data was submitted by 32 infusion centers and 19 radiation oncology departments. Each participating program was assigned a unique Hospital ID to maintain confidentiality. Data included information about the cancer program (Table 1, page 56), as well as billing information. The billing information included a report of all items billed to any patient who received services in the infusion and/or radiation department(s). Respondents submitted data in spreadsheet format with each row of data representing a single billed item by CPT and HCPCS code. The columns were:

- Unique patient identifier
- Date of service
- Code billed
- Units of code billed
- Revenue center
- The first three ICD-9 diagnosis codes associated with the billed service.

One year of data was requested, either the most recently complete 12 months or the most recently ended fiscal year. Cancer registry data was not reported or was reported in a format that could not be interpreted by six infusion and six radiation oncology centers and those centers are excluded from the cancer registry analysis. Four infusion and two radiation oncology centers reported less than a full year of billing data due to significant program changes that would skew the analysis. For these centers, data was annualized. Four infusion and three radiation oncology centers did not report diagnosis or reported diagnosis in a format that could not be utilized; those centers are excluded from the diagnosis-specific analysis.

For this analysis, several assumptions were made: all contributors are coding and billing correctly, diagnosis coding places a cancer diagnosis in the first three of the diagnosis code fields on each claim, and all centers interpreted the questionnaire in a consistent manner. In a few cases, we elected to disregard a program data point because responses were inconsistent or unclear (e.g., percent of curative versus palliative radiation treatments). In other cases, we realized that the question was not clear and therefore did not provide value (e.g., number of other radiation equipment units) and we excluded those from the analysis.

Data Contributor Profiles

Thirty-two infusion centers submitted data, of which four self-identified as "academic." Nineteen radiation oncology departments submitted data, of which four self-identified as "academic." For both infusion and radiation, an encounter is defined as one unique patient with services on one unique date of service. Thus, one patient who receives multiple infusions or multiple radiation fractions at a single encounter counts as one encounter. Table 2 (page 57) profiles the infusion centers, ranked by size. Small centers are those with fewer than 3,500 annual encounters, medium centers see between 3,500 and 5,500 annual encounters, and large centers have over 5,500 encounters each year. The average number of annual encounters is as follows:

- Small centers: 1,667
- Medium centers: 4,502
- Large centers average: 9,615.

Treated Patients vs. Registry Cases

The study looked to identify if a correlation exists between treated patients and cancer registry cases. In most cases, the registry data time periods did not parallel the billing data time periods. In addition, a patient receiving treatment in the current year may actually be a cancer registry new analytic case in the prior year.

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Still, a comparison of the number of patients treated to the number of analytic cases holds some interest as a secondary indicator of market share (second to Class of Case in the registry data). This is true in large part because while a Class of Case 1 patient received "all or most of the first course of treatment" at the hospital, that first course could consist of infusion elsewhere and radiation treatment at the institution. Few registries abstract to that level of detail. In addition to serving as a secondary market share view, this comparison can help to project capacity needs when a hospital is working to increase volumes through various strategic initiatives, as well as purchasing new radiation technology.

For infusion, data found that the number of breast cancer patients treated compared to registry cases is approximately 60 percent of the number of analytic breast cancer cases. For colorectal cancer that number is 55 percent. Lung is nearly 60 percent; however, prostate is only 30 percent. Intuitively these data seem logical as the major treatment options for prostate cancer are surgery and/or radiation.

The comparison of registry data to radiation patients revealed:

- The number of breast cancer patients treated is roughly 60 percent.
- The number of lung cancer patients is 58 percent.
- The number of colorectal cancer is 28 percent (again not surprising given the typical treatment options).
- The number of prostate cancer patients is substantially—and logically as noted above—higher at 85 percent.

Infusion: Oncology vs. Non-Oncology

Few infusion centers treat only oncology patients; however, the mix varies widely from one institution to another in part because when private physician offices provide infusions, the volume of oncology infusions is likely lower. By comparing the number of infusion patients with oncology-related diagnoses (ICD-9 codes 140-249.99, 285.22, 288.1, 787.01-03, 790.6, C71.9, V58.0, V58.1, and V58.11-12) to the number of patients with non-cancer diagnoses, we see that smaller centers have a slightly higher proportion of non-oncology than medium and larger centers: 48 percent, 39 percent, and 35 percent respectively. This finding might be because larger centers have sufficient volume to segregate oncology and non-oncology infusions into separate departments.

Infusion Hours

To construct various benchmarks around activity and productivity, we calculated the number of hours of actual treatments. For many infusion codes, the duration of the procedure is part of the description. For example, 96413 is defined as an initial infusion of one hour and 96375 is defined as a therapeutic push of up to 15 minutes. Where code descriptions do not have times, we estimated the following:

- Bone marrow aspiration or biopsy, all blood products (per unit), and "other" infusions, such as therapeutic phlebotomy, were all counted as one hour procedures.
- Vaccines were estimated at 10 minutes.
- Initiation of a prolonged infusion was estimated at 30 minutes.

Across all hospitals and for all types of patients, the average "time in a chair" is 1.5 hours. The mean times are consistent with this numer—1.4, 1.6, and 1.5 for small, medium, and large centers respectively.

Next, we determined that it would be useful to know how long patients with specific diagnoses receive active treatment in a chair. Specifically, we calculated these times for breast, colorectal, prostate, lung, and non-oncology patients. Colorectal treatments run the longest: 2.1 hours average for all centers with slightly shorter times in small centers (1.6 hours average compared to 2.3 hours average at medium centers and 2.1 hours at large centers.) Breast treatments average 1.5 hours and lung treatments average 1.8 hours with almost no variation across center size groupings for either disease. Treatment for prostate cancer is the shortest with an average of 1.1 hours for all centers and again virtually no variation across center size groupings. The differences between the various disease groups are likely the result of different treatment regimens as some drugs must run over many hours while others are short infusions. Finally, for non-oncology infusions, the average time is 1.2 hours for centers of all sizes.

Infusion Nursing Productivity

Perhaps the two most commonly requested benchmarks are the number of chairs per infusion nurse and the number of encounters per infusion nurse. Another extremely valuable benchmark is the number of hours of actual infusion time each nurse performs on an annual basis. We measured chairs in terms of available chair hours (i.e., hours of operation multiplied by the number of chairs). We measured worked hours of infusion nurses by multiplying the percent of FTE nurses reported by 2,080 (the standard measure for one year of full-time effort). Here's what we found:

- The number of chairs per FTE nurse averaged 3.2 for small centers, 4.3 for medium centers, and 3.4 for large centers. More interesting is the range—from 2 to more than 5 chairs per nurse.
- The number of annual encounters for a full-time nurse was 438.9 for small centers, 652.7 for medium centers, and 628.4 for large centers.
- The number of active infusion hours for one full-time nurse was 1,182 for small, 1,654 for medium, and 1,446 for large centers. Curiously, some centers show more than 2,080 hours of infusion time per nurse. Since 2,080 hours is considered "full time" this number seems impossible. Recognize, however, that nurses are treating several patients at the same time in the nurses' assigned chairs.

Other factors affect this benchmarking data, such as other duties the infusion nurses perform and whether support staff is assigned in the chemo suite to perform non-nursing tasks. In addition, it is possible that staff at smaller centers is simply not as efficient with processes, such as chemo double checks, checking for potential drug reactions, and coverage for breaks even when the volumes are low. Still, centers with particularly low chair-to-nurse ratios may wish to delve into staff productivity, particularly as it is affected by task assignments. Conversely, those centers with particularly high ratios might want to review their operations to ensure that they are not adversely affecting safety by over-loading staff with too many patients.

Physician-Related Infusion Benchmarks

The final benchmarks in the infusion section cover the number of nurses needed for each full-time oncologist and the number of encounters generated by a full-time oncologist. The former is a very valuable data point for centers that anticipate adding or losing physicians since those changes will obviously have an impact on the number of staff needed in the infusion suite. The data was segregated for centers that reported having only "employed" oncologists, those that reported having only "private practice" oncologists, and those that reported a mix of the two staff models.

The results are not surprising in that intuitively we would expect "employed" physicians to require more nurses and to generate more encounters because the hospital infusion suite is their only venue for treating their patients. What is extremely interesting here is the difference between what "employed" physicians require and generate and what "private practice" physicians require and generate. For centers with only "employed" oncologists, the average number of full-time nurses required is 2.26 while "private" oncologists only require 0.7 FTE nurses to care for their referred patients. Perhaps one of the most valuable infusion-related benchmarks is the number of encounters that one full-time oncol-

Table 1. Program Data Points

STAFFING (FTEs budgeted for the fiscal year)
Infusion non-physician practitioners
Infusion nurses
Infusion LPN/NAs
Infusion (other)
Radiation non-physician practitioners
Radiation physicists
Radiation dosimetrists
Radiation therapists
Radiation nurses
Radiation LPN/NAs
Radiation MAs
Radiation (other)
EQUIPMENT & RESOURCES (for the fiscal year)
Number of outpatient infusion chairs and beds
Number of linear accelerator units
Number of Cyberknife® units
Number of Gamma Knife® units
Number of other radiation equipment units
Standard hours of treatment operations in each department
MEDICAL STAFF (only clinical FTEs for the fiscal year)
Number of FTE hematologists/oncologists using only the hospital infusion center
Number of FTE hematologists/oncologists using another infusion center in addition to the hospital's
Number of FTE radiation oncologists (excluding any time spent using non-hospital equipment)

ogist will generate as this has tremendous importance when planning for expansion through growth or through acquisition of a practice. On average, one full-time “employed” oncologist orders 1,177 infusion visits per year; “private” oncologists order 72 percent fewer encounters at 331 per year.

Radiation Daily Treatments

To define treatments, we counted all billing codes that define treatment delivery. This includes all types and modalities, such as external beam, stereotactic radiosurgery, stereotactic body radiation therapy, high-dose rate radiation, MammoSite, Gamma Knife, and more. To calculate daily treatments, we summed the number of billed treatment codes and divided by the number of dates on which any treatment code was billed (Table 3, page 58).

Among the most commonly requested benchmarks are those relating to the number of treatments per patient. We calculated those numbers for all diagnoses as well as for breast, colorectal, prostate, and lung cancers. Of note, these figures include both curative and palliative treatments. Unfortunately, the variability of diagnosis coding practices among data contributors makes it impossible to segregate the two because some centers may code the metastatic site in the first or second diagnosis code slot while others may code the initial site of disease first or second.

Prostate cancer patients lead the way with an average of 22.5 treatments, which is not surprising since radiation is among the most common approaches in treating this disease. Breast cancer patients follow closely with 21.8, while colorectal cancer patients receive 18.3, and lung cancer patients average 14.5 treatments (Table 4, page 58).

IMRT & IGRT

Cancer centers often ask what proportion of treatments is intensity-modulated radiation therapy (IMRT) and/or image-guided radiation therapy (IGRT). Payers often develop policies regarding the “acceptable” indications for these modalities, and centers do not want to find that their utilization of these modalities is high enough to spur an audit. To measure the proportion of IMRT to IGRT, we compared the number of IMRT and IGRT codes billed to the total number of treatments billed. On average, for all centers, 33.7 percent of all treatments are IMRT (see Table 5, page 59). Here is the data by the four major disease sites:

- Prostate cancer leads the way at 27.3 percent of all IMRT treatments
- 4.3 percent of all IMRT treatments are for lung cancer
- 2.8 percent of all IMRT treatments are for breast cancer
- 2.1percent of all IMRT treatments are for colorectal cancer.

Several of the small and medium centers do not have IGRT capabilities, but for those that do, IGRT represents 22.6 percent of all treatment codes for small centers and 37.1 percent of all treatment codes for medium centers. At large centers, IGRT represents 28.1 percent of all treatment centers.

Table 2. Infusion Center Profiles

HID	SIZE	ACAD/ COMM	INFUSION ENCOUNTERS	INFUSION PATIENTS
H17	S	C	985	110
H36	S	C	1,141	222
H35	S	C	1,177	274
H8	S	C	1,202	315
H11	S	C	1,436	571
H30	S	C	1,473	172
H5	S	C	1,705	642
H13	S	C	2,823	383
H19	S	C	3,064	619
H31	M	C	3,501	376
H15	M	C	3,587	485
H3	M	C	3,632	328
H37	M	C	3,694	382
H33	M	C	4,053	968
H18	M	C	4,268	481
H21	M	C	4,818	827
H12	M	C	5,107	623
H10	M	C	5,125	988
H23	M	C	5,367	749
H14	M	C	5,418	891
H27	M	C	5,453	765
H25	L	A	6,428	2,419
H24	L	C	6,531	1,536
H4	L	C	6,532	1,141
H7	L	A	6,842	889
H29	L	C	6,993	637
H1	L	C	7,197	907
H6	L	C	7,526	868
H22	L	C	11,996	1,667
H9	L	A	12,020	1,646
H2	L	A	15,544	2,712
H26	L	C	18,158	2,864

Small = <3500 annual encounters; Medium = 3,500–5,500 annual encounters; Large = >5,500 annual encounters

Table 3. Radiation Center Profiles

HID	SIZE	ACAD/ COMM	DAILY TREATMENTS	PATIENTS
H36	S	C	4	216
H13	S	C	9	90
H5	S	C	11	405
H23	S	C	16	216
H37	S	C	20	284
H33	S	C	22	326
H7	M	C	26	290
H10	M	C	28	331
H27	M	C	29	446
H21	M	C	35	625
H1	M	C	36	422
H22	M	C	37	508
H4	M	C	46	701
H26	L	C	55	802
H20	L	C	56	660
H2	L	A	60	1,423
H24	L	C	64	972
H25	L	A	66	2,045
H9	L	A	69	1,080

Small = <25 daily treatments; Medium = 25-50 daily treatments; Large = >50 daily treatments

Radiation Staffing Productivity

We calculated the number of hours of linear accelerator (linac) operation and compared that to the number of hours reported for therapists, dosimetrists, physicists, and radiation oncologists. Note that these data report all therapists, including simulation therapists. Here, large centers average 3.7 therapists per linac which is somewhat higher than small centers at 2.9 therapists per linac and medium centers at 3.0 therapists per linac. Likely this variation is the result of higher complexity and more modalities of radiation services in the large centers.

Dosimetry is less varied across institution sizes (.78 dosimetrists per linac for small centers, .82 dosimetrists per linac for medium centers, and 1.0 dosimetrists per linac for large centers). Physics showed some small differences (small centers have an average of .77 physicists per linac, medium centers have an average of 1.0 physicists per linac, and large centers have an average of 1.25 physicists per linac). This data seems logical since the larger centers generally have more complex technologies.

The Centers for Medicare & Medicaid Services (CMS) have specific requirements regarding the supervision of outpatient therapeutic services including radiation. Those rules require that there be a properly qualified, trained, and credentialed provider present during the delivery of treatments. The rules do permit the supervising provider to be a non-physician practitioner (NPP) although in many states, the scope of practice for NPPs may not cover radiation, and the state radiation safety regulations may require a physician's presence. In our survey, we find that while the average number of radiation oncologists per linac is 1.0 for small and medium centers and 1.3 for large centers, the range is from .5 to 2.0. A center with .5 radiation oncologists per linac might have two machines, which is acceptable, but for those with less than a full-time physician for full-time linac operations, there may be a need to explore other means of coverage to remain compliant.

The last benchmark data point analyzed is the number of patients per staff category. Here we found that, on average, small centers handle 77 patients per therapist, 355 patients per dosimetrist, 371 patients per physicist, and 243 patients per radiation oncologist. For medium centers, those numbers are 86 patients per therapist, 328 patients per dosimetrist, 244 patients per physicist, and 30 patients per radiation oncologist. Data for large centers found 122 patients per therapist, 454 patients per dosimetrist, 418 patients per physicist, and 350 patients per radiation oncologist. The numbers for large centers are somewhat higher than we expected although not alarmingly so. We also note that it appears that the learning curve for dosimetrists with IMRT seems to have eased, making them more productive than noted in previous years' anecdotal observations.

The 2014 Survey

The response this survey was remarkable and OMC plans to repeat and expand on the study in 2014. We expect to release the call for data in mid-2014 for data from calendar year 2013. For that study, we plan to expand not only the number of centers to a goal of at least 100, but to expand the data points and to

Table 4. Average Radiation Treatments per Patient

DISEASE GROUP	ALL CENTERS
Prostate cancer patients	22.5
Breast cancer patients	21.8
Colorectal cancer patients	18.3
Lung cancer patients	14.5
All patients	17.4

Table 5. IMRT Utilization

INSTITUTION	BREAST CANCER AS % OF IMRT	COLORECTAL CANCER AS % OF IMRT	PROSTATE CANCER AS % OF IMRT	LUNG CANCER AS % OF IMRT	IMRT AS % OF TOTAL TREATMENTS
OVERALL	2.8%	2.1%	27.3%	4.3%	33.7%
H1	1.7%	3.3%	54.3%	8.9%	35.2%
H10	12.8%	1.8%	41.5%	4.7%	48.3%
H13					28.5%
H2					46.6%
H20	0.0%	5.1%	49.5%	2.3%	22.9%
H21	0.0%	4.4%	42.5%	12.5%	34.5%
H22	2.0%	4.2%	36.6%	10.8%	29.8%
H23	0.6%	0.0%	31.5%	13.6%	25.6%
H24					35.4%
H25	0.0%	4.6%	27.4%	0.4%	22.8%
H26	7.3%	1.9%	48.4%	4.6%	34.2%
H27	0.7%	6.9%	44.2%	0.8%	28.9%
H33	7.2%	0.0%	10.8%	12.6%	6.7%
H36	0.0%	0.0%	71.2%	0.0%	28.0%
H37	0.0%	0.0%	24.6%	1.1%	14.7%
H4	0.0%	2.5%	60.8%	0.0%	17.1%
H5					29.4%
H7	11.0%	3.1%	37.6%	9.2%	71.6%
H9	2.0%	0.8%	11.2%	5.4%	51.2%

No data = hospitals without diagnosis data or without IMRT

work on the granularity of several of those data points. We hope to add staffing benchmarks for pharmacy, social work, navigators, tumor registrars, genetic counselors, financial counselors, non-physician practitioners, and radiation nurses. We will also drill down on various categories of staff (e.g., infusion nurses versus LPNs and treatment therapists versus simulation therapists), as well as on data such as disease groups for non-oncology infusions and various radiation modalities and hours of operations for detailing staffing benchmarks. We will look for ways to match up tumor registry cases to treated patient cases if this can be done without placing an onerous burden on our data contributors. And finally, we welcome any suggestions from cancer center administrators to help us continue to build a more robust data set as we move forward to bring these valuable productivity benchmarks to oncology administrators across the country. OI

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