Completion Curve

Figuring Out Patient Contributions

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Many of our clients would like to know the financial impact of bringing in patients from Healthgrades.com search. Once a patient attends an appointment at a hospital or clinic, we know immediately how much money that first encounter provides to the hospital. However, we would really like to know the impact of these patients within 2 years – the period in which they could still be considered "new" patients. It is during this time that the initial search that resulted in an appointment would come to fruition as a true case – the patient would have many encounters related to the initial search and hopefully would have resolved their initial need.

Reference:
https://questions.cms.gov/faq.php?id=5005&faqId=1969

What is the completion curve?

The completion curve is simply a table listing months 1 through 24 of a patient's first two years after a phone call to the medical provider. Along with each month is a percentage of the total financial contribution that we would expect that patient to make in 2 years. It starts out small, only 11% in the first month, but it builds up quickly to nearly 60% of the total contribution at 1 year. Here is the full completion curve table:

Month	Completion Curve
1	11%
2	18%
3	23%
4	28%
5	32%
6	36%
7	40%
8	45%
9	48%
10	52%
11	55%
12	59%
13	62%
14	66%
15	69%
16	73%
17	76%
18	80%

19	83%
20	86%
21	90%
22	93%
23	97%
24	100%

Graphed by month, the data show a slight curve compared to a straight line.
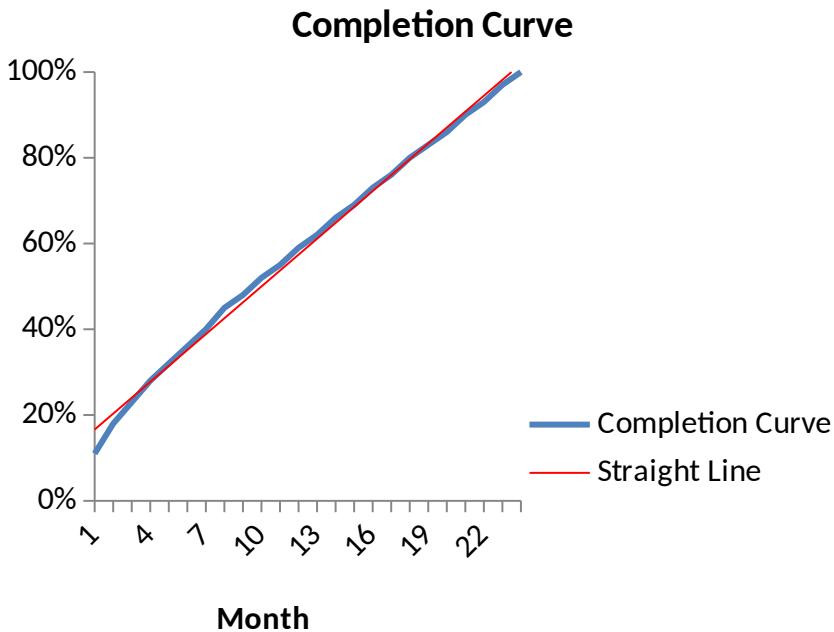
Completion Curve

The curve looks nearly linear, but the line is actually a subtle curve. For those interested, a 6th-order polynomial curve matches the line very well.

How was it built?

The completion curve was built by examining new patients in large databases of medical encounters. We looked at the first two years of medical encounters starting from the patient's first visit, and simply totaled the amount of contribution (the amount paid for the encounter subtracting the cost for the encounter) of each encounter by month. Then we added each month to the prior month to generate a running total. This running total is then divided by the total amount we saw within 2 years. Here's an example to illustrate:

Month	Contribution	Running Total	Percent of 2-Year Total
1	$110,000	$110,000	11%
2	$70,000	$180,000	18%

3	$50,000	$230,000	23%
4	$50,000	$280,000	28%
5	$40,000	$320,000	32%
6	$40,000	$360,000	36%
7	$40,000	$400,000	40%
8	$50,000	$450,000	45%
9	$30,000	$480,000	48%
10	$40,000	$520,000	52%
11	$30,000	$550,000	55%
12	$40,000	$590,000	59%
13	$30,000	$620,000	62%
14	$40,000	$660,000	66%
15	$30,000	$690,000	69%
16	$40,000	$730,000	73%
17	$30,000	$760,000	76%
18	$40,000	$800,000	80%
19	$30,000	$830,000	83%
20	$30,000	$860,000	86%
21	$40,000	$900,000	90%
22	$30,000	$930,000	93%
23	$40,000	$970,000	97%
24	$30,000	$1,000,000	100%

In this example, a patient brings in $1,000,000 to the hospital within 2 years. In the first month, the patient brought in $110,000. Perhaps the patient had a procedure. In month 2, they brought in $70,000, totaling $180,000 for the first two months. Perhaps they had a follow-up visit after the procedure.

Now it is very likely that actual patients do not have encounters every month, as in the example. But most patients have an appointment within a certain amount of time, and then come in less often as time goes by. The completion curve shows that about 60% of the activity occurs within the first year, which is to say that patients usually make an appointment within 1 year after their initial call. Some patients have their first appointment in month 1, some in month 3, and others in month 6.

We also validated the completion curve by running a comparison between actual results and the curve, using a number of encounters from a variety of sources.

Completion Curve Validation
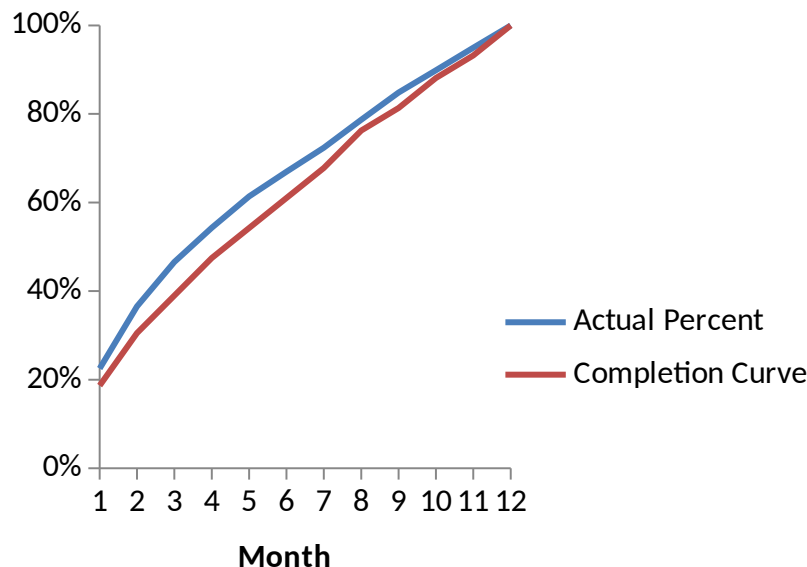
The results match up well, and the completion curve is slightly under the actual result, and as such it is a conservative estimate.

How is the completion curve used?

The curve is applied by looking at how much time has elapsed between the patient's first call to the hospital after completing a search and the first encounter at the hospital. If only 1 month has gone by, we take the total contribution for that encounter and divide it by the completion curve rate for the 1st month. This gets us to the estimated 2-year total contribution for the patient.

In our example above, if the patient had only 1 month of activity, with $110,000 total contribution, then we would divide the contribution by the month 1 completion curve rate of 11% to obtain $1,000,000 for the estimated 2-year contribution. This is done for every patient that calls in and has an encounter at the hospital, and totaled up across patients for a grand total estimate of the 2-year impact of these patients.

Using the completion curve in this manner accomplishes two goals: 1) It forecasts the total contribution for each patient. 2) It sets each patient on the same level as other patients. The result is a rather robust prediction of the impact of patient activity from the Healthgrades.com website.

A Note on Terminology

I have used the term "hospital" in this paper, but the situation could apply to a physician office, an outpatient surgery center, or an entire system of medical practices. Scaling up to a system makes the interactions with patients more complex, and a "new" patient at one location may not be new in

another. Additionally, a patient's contribution may include more types of visits from other locations in the system.