Title

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Many emergency departments (EDs) compare themselves to national productivity benchmarks, such as the average patients/hour or relative value units (RVUs)/hour. Making these comparisons does not provide a tool to determine which processes need improvement, most urgently, within the ED to improve efficiency. Furthermore, there has been no clear means to determine how to set reasonable goals based on the capabilities of the particular ED under study. Determining the power of a process is a tool that can provide the ED with these missing pieces of information. [West J Emerg Med. 2013;14(5):551–554.]

BACKGROUND

A previous paper describes how to measure an emergency physician's work by combining clinical hours, patients seen, and relative value units into a single metric.[1] This article will use the same concept, but instead combines length of stay (LOS) hours, patients (PTs) seen, and relative value units (RVUs) to determine the workload of a specific process. Most any activity performed in an ED could be considered a process. Common examples are discharged patients or admitted patients.

Measuring the workload of a process requires 3 specific terms. Let us start by learning how these 3 terms give us a measure of the workload. The more time patients spend in the ED, the more labor is required from the staff to care for and monitor those patients. Therefore, the LOS hours is a factor contributing to the workload. Another factor is the number of patients that create those LOS hours. Clearly if more patients are in the ED, then more resources are required to care for those patients. A third factor contributing to the workload is the level of difficulty or effort required. A reasonable measure of difficulty or effort is the amount of physician RVUs that were performed on a patient. We are not restricted to these specific terms, but combining these 3 terms into a single metric in the manner shown in the cited article gives a reasonable measure of the total workload of a specific process.

Next we need to realize that workload is not the final measure we care about. What is important is how well we are performing the work involved in a given process. The measure that tells us how well we are performing work is

power. Power is defined as the rate at which the workload is being accomplished and is one measure of efficiency. It is determined by dividing the workload of the process by the time spent on this process, in this case the LOS hours. The more work the ED can handle per LOS hour, the more powerful the process becomes.

In a given ED, it might turn out that the workload of discharges is accomplished with 100% power. If the corresponding power of admissions was only 85%, you now know that the admission process is performing less work per unit of time than the discharge process. A well-performing ED would be expected to perform all equivalent work in equal amounts of time. Once we know that the admission process is not as powerful as the others, we can now make it a priority for improvement. The power measurement is meaningful even when the workload amount is different for the various processes.

By means of an example, this article will show how to use power to quantify the level of performance of a process. This approach leaves the well-running processes alone while concentrating on the weaker ones. We don't have to change the entire ED to improve the inefficient processes. Another advantage to quantifying power, or efficiency, is that we need not select arbitrary process improvement changes. It is often said that this year we are going to improve a specific goal by 10%, arbitrarily. If we quantify the power of processes in an ED, we can predict what change is required to get the level of performance of which we are capable. It will be shown by example how to avoid arbitrary goal changes and instead select the optimum goal.

Table 1. Power based on length of stay (LOS).

Disposition	LOS hours	% LOS	Workload	Power
Discharged	2,000	51.0%	51.0%	100%
Admitted	1,200	30.6%	30.6%	100%
Observation	625	15.9%	15.9%	100%
Transferred	100	2.5%	2.5%	100%
Total	3,925	100.0%	100.0%	100.0%

EXPLANATION OF TERMS

Length of stay hours are defined as the cumulative time that patients are in the ED. Relative value units are considered one measure of the level of effort that is put into a patient while they are in the ED. LOS hours, patients, and RVUs all use the resources within an ED. The workload of a given process is defined as the average of their LOS hours, number of patients, and number of RVUs, where each of these is expressed as a percentage of their respective totals. Combining these terms into a single measure gives us a measure of the total workload of a given process. For example, let's say that discharged patients were in the ED 50% of the total hours that all patients were in the department. At the same time this group included 48% of the total patients while acquiring 60% of the total RVUs. The average of these 3 terms, 52.7%, is the workload of the discharged patients on the ED. The statistical relevance of this measure is explained in a previous article.[1] We are not limited to terms like LOS hours, patients, and RVUs, but they are a reasonable terms for the purpose of our example.

Once the term for workload is defined, the power that goes into this work can be determined. Power is the rate at which work is accomplished. So taking the workload and dividing it by the time invested in that workload, the LOS, gives the power of that process. The more powerful processes are capable of handling more patients and RVUs for a given amount of time and are considered to be more efficient.

EXAMPLE

The key to understanding the value of the power of your processes is to first look at LOS. To be clear, LOS is not the average LOS/patient. It is the cumulative hours that all the patients involved in a particular process spend in the ED. As we progress through the example, you will see how linking other meaningful data to the LOS and determining the power gives a better picture of how various processes are performing. Assume we are interested in the 4 basic dispositions of the ED, which are patients discharged, admitted, placed in observation status, and transferred. We are not limited to these categories. For example the International Classification of Diseases (ICD) diagnoses or age groups (stroke, acute coronary syndromes, orthopedic trauma, pediatrics) are other valuable categories to explore.

Table 1 lists the cumulative LOS hours for each of the

department's dispositions. With this single set of information, our conclusions are limited. At most we might be able to conclude that if we were going to consider making any changes, we might look at the discharge process first because it involves the highest workload. So improvements here should have the biggest impact. The power says all of the processes at this point are actually equal. Before making changes based on this information, maybe we first need to include more meaningful data.

Next look not only at the LOS hours but also the number of patients that make up those hours (Table 2). Combining these 2 terms changes the workload and power results. The process for getting patients into observation status is doing quite well while the other 3 dispositions are less powerful at 96.7%. At this point we would have to conclude that we better improve the discharge, admission, and transfer processes. Realize that we could also make a similar conclusion by comparing the LOS/PT for our dispositions. As we proceed we will notice that LOS/PT will no longer contribute to the decision-making process.

We can further improve our understanding of the influences on our LOS by considering the effort we put into the patients while in the department (Table 3). Here we included the RVUs associated with each disposition to calculate the combined workload and power. Notice that each time new data is included, the workload and power change, but the LOS/PT has not. This is why the LOS/PT is not a reliable variable to consider when measuring performance. Looking at the LOS/PT in Table 3 would lead us to the same conclusion we had from Table 2. However, looking at the power in Table 3 leads us to a more informed and different conclusion. We now conclude that the discharge and observation processes are doing well with higher power values compared to the admission and transfer processes.

IMPACT OF POWER

Let's now look at the impact of using the results of Table 3. We know we should improve both the admissions and transfer processes. The workload of the admission process is much greater than the transfer process. Therefore, to have the greatest overall impact, it is reasonable to put our efforts into improving the admission process first. Since the workload of the admission process is 26% of our total workload, we would like to spend no more than 26% of our total LOS hours on these patients. Therefore, a reasonable goal would be 26% of the 3,925 total hours, or 1,020 hours as the goal for the ED's LOS hours for the admitted patients. Table 4 shows the results for achieving the 1,020 LOS hours with all else remaining the same. By concentrating on the worst process and reducing the admitted patients to 3.4 LOS hours/PT, the overall ED LOS hours/PT decreased by 5% to 3.57 hours/PT.

If we were to focus on the LOS/PT numbers in Table 4, we might be tempted to think that discharges and transfers are what need improvement because they have the highest LOS

Table 2. Power based on length of stay (LOS) and patients.

Disposition	LOS hours	Patients	% LOS	% Patients	Workload	Power	LOS/Patient
Discharged	2,000	500	51.0%	47.6%	49.3%	96.7%	4.00
Admitted	1,200	300	30.6%	28.6%	29.6%	96.7%	4.00
Observation	625	225	15.9%	21.4%	18.7%	117.3%	2.78
Transferred	100	25	2.5%	2.4%	2.5%	96.7%	4.00
Total	3,925	1,050	100.0%	100.0%	100.0%	100.0%	3.74

Table 3. Power based on length of stay (LOS), patients and relative value units (RVU).

Disposition	LOS hours	Patients	RVUs	% LOS	% Patients	% RVUs	Workload	Power	LOS/Patient
Discharged	2,000	500	800	51.0%	47.6%	60.2%	52.9%	103.8%	4.00
Admitted	1,200	300	250	30.6%	28.6%	18.8%	26.0%	85.0%	4.00
Observation	625	225	250	15.9%	21.4%	18.8%	18.7%	117.5%	2.78
Transferred	100	25	30	2.5%	2.4%	2.3%	2.4%	94.0%	4.00
Total	3,925	1,050	1,330	100.0%	100.0%	100.0%	100.0%	100.0%	3.74

Table 4. Improving the admitted patients length of stay (LOS) hours.

Disposition	LOS hours	Patients	RVUs	% LOS	% Patients	% RVUs	Workload	Power	LOS/Patient
Discharged	2,000	500	800	53.4%	47.6%	60.2%	53.7%	100.6%	4.00
Admitted	1,020	300	250	27.2%	28.6%	18.8%	24.9%	91.3%	3.40
Observation	625	225	250	16.7%	21.4%	18.8%	19.0%	113.7%	2.78
Transferred	100	25	30	2.7%	2.4%	2.3%	2.4%	91.2%	4.00
Total	3,745	1,050	1,330	100.0%	100.0%	100.0%	100.0%	100.0%	3.57

RVU, relative value unit

hours/PT. Discharges should be left alone for now because the better power result of 100.6% tells us that for those patients we are doing about 4 hours of work, so their LOS hours/PT is reasonable. The admitted patients have improved to a 3.4 hours/PT but are still at the lower power of 91.3%. While their LOS decreased we still are not performing 3.4 hours of work on these patients, compared to the other types of work performed in the ED. At this point we need to continue to work towards getting them out of the department sooner. They are taking up valuable workspace in the ED that could be better used.

The reason the power for admissions did not achieve 100% with this one change is because this process is iterative. Each time changes are made, relative comparisons are given to find the new, less powerful process. In this example, after the initial changes are implemented, we see by looking at the power that admissions and transfers still need further process improvements. This method provides calculable and reasonable step-by-step, rather than arbitrary, changes.

COMMENTS

Measuring power provides a tool that gives insight into what processes are a priority for improvement. This approach does not involve comparing the ED to a national benchmark;

it compares the ED to itself to find its own weaknesses. While it may be interesting to know how an ED compares to other departments, knowing this does not give insight into how to make improvements within your department. This power approach can provide two distinct advantages. It shows what processes need attention. It also provides a reasonable magnitude of changes for new goals. This method depends on the type of resources and department dynamics (e.g. morale) currently available to the ED rather than a comparison to an outside source. Once all processes are at their best possible power, then the ED is performing at its highest level. Further improvement in the ED would most likely require improving the type of resources available to the department or the state of the department.

LIMITATIONS

This model assumes that other factors not accounted for remain constant. These factors would include the physician, nursing and ancillary staff, as well as typical support services such as x-ray, ultrasound, and consultants for example. Workload measurements for nursing and ancillary staff could be included with the 3 factors used in this example as additional information becomes available.

The results of this method do not depend on revenue or

the RVU reimbursement rate. It does assume that an RVU is a reasonable measure of the effort performed. If other meaningful measurements are available, they could replace the RVU or be included with the three current factors to enhance the results. Since RVU reimbursement rates can vary, it would be reasonable to accept a less powerful process for those with higher revenue returns. Taking revenue into account along with the power of a process is the next logical step.

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REFERENCE

1. Silich BA, Yang J. "Measuring Emergency Physicians' Work: Factoring in Clinical Hours, Patients Seen, and Relative Value Units into 1 Metric." 2012, *West J Emerg Med*. 13(2):176-180.