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The Cost-Benefit from the Perspective of the Hospital of a Proactive Psychiatric Consultation Service on Inpatient General Medicine Services

Sledge WH[1]*, Bozzo J[2], White-McCullum BA[2] and Lee H[1]

[1]*Department of Psychiatry, Yale School of Medicine, 300 George Street, Suite 901, New Haven, USA*
[2]*Yale New Haven Health, 20 York Street, New Haven, USA*

Abstract

Objective: Co-occurring mental illness and substance abuse disorders, highly prevalent in general medical inpatients, are associated with longer Lengths of Stay (LOS) and higher costs. We examined the increased financial costs and benefits associated with a proactive multidisciplinary intervention, the Behavioral Intervention Team (BIT), relative to the fiscal benefit.

Methods: Costs and benefits associated with a Conventional Consultation Liaison (CCL) model and the BIT on three general inpatients units of a tertiary care hospital in a before-and-after design.

Results: Inpatients seen by the BIT had reduced LOS, resulting in lower per-case costs and incremental revenue from new cases. Total financial benefit when offset by additional BIT personnel costs resulted in a return of investment of 1.7:1.

Conclusion: Compared to the reactive CCL model, the proactive BIT resulted in significant financial benefit. Further study is needed to examine the impact of BIT model on quality of patient care and staff satisfaction.

Keywords: Hospital economics; Proactive consultation; Length of Stay (LOS); Multidisciplinary team; Cost benefit

Introduction

As the United States health care system transforms under the Affordable Care Act (ACA) and other initiatives, new ways of providing care must be created to provide the best care possible in a cost effective manner. The triple aims of the ACA explicitly demand a cost effective approach to the provision of services.

In prior publications we have reviewed the literature [1] and demonstrated, through our initial proof of concept study [2] and an implementation trial [3], the effectiveness of a proactively organized consultation intervention for inpatient medical care.

In the implementation publication we described an 11-month trial of the Behavioral Intervention Team (BIT) comprised of psychiatric, social work, and nurse practitioner efforts [3]. In this before-and-after study, we compared usual consultation with a team of mental health professionals who screened all admissions to three general medical units (total census of 92 patients) and proactively engaged those who had a history or presented signs and symptoms of substance abuse and/or mental illness upon admission. We consulted formally on 9.9% of all patients and for an unrecorded, substantial number, advised their team (without formally consulting on the patients) how to handle routine matters of mental illness and substance abuse disorders and how and where to refer them upon discharge. We referred to these consultations with only staff as "curbside" consultations. We also evaluated patients for sitter (constant companion) use and helped to make more efficient the flow of patients especially when transfer to psychiatric hospitalization was the planned next level of care. This advanced planning reduced discharge-related wait times and reduced the expense (lost revenue) of uncompensated days (or denied days) when a patient had to wait for a psychiatric bed after they were medically cleared. We found a 0.65 day reduction in Lengths of Stay (LOS) for those who were in the hospital less than 30 days ($p<0.0001$) for the BIT patients compared to the patients seen by conventional consultation on the same units in the year before. We also noted a 0.3 day length of stay reduction among all the patients for whom we did not formally consult, compared with patients on the same services and same time period in the prior year. This reduction was despite a comparatively increased incidence of psychiatric co-morbidities and ICU stays, both factors typically associated with increased average LOS in the comparison cohort of patients. Furthermore, we could not identify a secular trend within our hospital for reduced length of stay from other reasons during the time of the study. However, this finding must be documented before it can be confidently claimed and we have not included that presumptive benefit in our cost benefit analysis reported here. The present study is a report of the cost-benefit of the 11 month before-and-after trial noted above.

Review of the literature

The history of the provision of psychiatric consults on general and specialty inpatient services has frequently focused on the potential cost saving aspects to justify its expense. The introduction of a psychiatric consultation service by Billings noted enthusiastically the savings of "about 43 dollars per patient" after implementation of a psychiatric service [4]. Other studies followed emphasizing the economic benefits of the intervention. Lyons et al. found that earlier consultations during the hospitalization were associated with shorter LOS [5]. Probably the most carefully conducted random control study did not show a positive cost benefit [6]. In contrast to Kishi et al. [6] and Leveson et al. [7] found the CL patients had a longer LOS of 1.1 days compared to the control group.

***Corresponding author:** Sledge WH, Department of Psychiatry, Yale School of Medicine, 300 George Street, Suite 901, New Haven, CT 06511-6662, USA, Tel: (203) 214-3002; E-mail: william.sledge@yale.edu

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Goals

The study goal of this report is to assess the effect on the costs and benefits of the BIT intervention.

Cost effectiveness

General considerations: Cost-effectiveness studies typically take the perspective of one party in the relationships among several potential parties: patient, treater/provider, insurer/payer, and/or society [8]. The goals of these four perspectives are not always congruent; hence there is the opportunity for conflict of values and outcomes. In this study we take the perspective of the hospital as provider. If the perspective is that of the provider, then the benefit consideration (setting aside general humane considerations) is the revenue and cost savings of the intervention for the providers compared to its full cost to the provider. If the perspective is the cost to society, then the cost is more complex and must take into consideration the quality of life for the patient, the cost to the patient, insurers, providers and the benefit is not merely the efficiency and unencumbered revenue, but the entire experience (i.e., cost to the patient and quality adjusted life years compared to the control condition). We take the perspective of the hospital provider in order to explore more clearly and practically the operational advantages of the BIT and guide institutional decision makers as to whether this is an intervention that they would seek to adopt and develop in their own settings.

Methods

Intervention

The Yale Behavioral Intervention Team (BIT) is a multi-disciplinary (nursing, social work and psychiatry) consultation service located at and supported by Yale-New Haven Hospital (YNHH) and collaboratively managed by the Department of Psychiatry consultation liaison services. The aim of this program is to provide the highest quality care possible as quickly as possible. This goal is achieved by changing the paradigm of psychiatric consultation liaison services from "reactive" to "proactive." This change recognizes and treats behavioral health problems among hospitalized medical patients as soon as possible, before their problems cascade into greater ones and provides support to medical personnel effectively and efficiently.[9] In addition to the care of individual patients, the BIT educates staff and assists them with the care of the patient while in the hospital and with a discharge disposition that includes additional psychiatric and behavioral care if needed after medical hospitalization.

The BIT functions by screening all patients upon admission to the general medical services of the Yale New Haven Hospital (York Street Campus) and providing prompt (by hospital day 2) formal consultation for patients whose screening reveals a need for on-going treatment or management of psychiatric illness. In performing this task, BIT members actively look for patients who are distressed and/or manifesting behaviors, however subtle, that may come to interfere with their physical care. The team seeks to identify active mental illness and substance abuse disorders at their earliest possible time during the hospitalization. In focusing on early recognition, the BIT seeks to: 1) Provide interventions that will mitigate the effects of their patients' mental or substance abuse disorders on their physical healthcare; 2) Educate and support the various professional disciplines caring for patients; and 3) Assist non-psychiatric staff in the management of flow and disposition for patients who require downstream behavioral health care. The program screens all admissions to the medical services to determine who might benefit from a formal consultation and, with the permission of the medical team, carries out this consultation. Concurrent with the evaluation, the team members educate their corresponding professional medical team colleagues (MD to MD, nurse to nurse, and social worker to social worker), focusing first on immediate patient needs and later on the roles of the family and the referral process for on-going care. In addition, for patients who are not formally consulted but for whom a psychiatric or substance abuse issue may exist, there is extensive advice given about approaches to the care of the patient and possible post hospitalization referral options, the so called "curb-siding" noted above.

This change in paradigm was instituted in order to address the perception that our hospital's standard "reactive" psychiatric consultation liaison model was not as effective as all the stakeholders wanted and needed. Consultations done under the standard Conventional Consultation Liaison (CCL) model were not timely, as they were often requested late in the patient's hospitalization, nor were they maximally effective, because the behavioral health problems had already had their negative effects on the care experience. Late consultations had virtually no chance of being of any substantive use. Furthermore, there were frequent inappropriate requests for consultations to address trivial problems, while major problems were ignored or delayed in being addressed. Consequently, the opportunity for therapeutic effectiveness of psychiatric intervention was needlessly delayed or completely absent.

Additionally, there were a growing number of patients admitted to medical services with active mental illness or substance abuse disorders that were perplexing to the medical staff and who complicated the staff's ability to treat and refer these patients effectively. On some services, over 50% of patients suffered co-morbid substance abuse and/or mental health problems. We noted that some patients created a degree of havoc and discomfort among medical and nursing staff that interfered with staff effectiveness and compromised staff ability to engage their patients with the full resources of the services.

In addition to clinical care and education, the BIT provided rapid assistance in risk assessment for patients threatening self-harm (suicidal) and helped facilitate timely and appropriate discharge dispositions. These educational and managerial processes had a direct effect on the use of constant companions (i.e., sitters), and on denied days (i.e., unpaid stays on medical inpatient services once medical care is completed and the patient is awaiting suitable disposition for psychiatric care). Managing these functions of flow and discharge disposition improved patient care and increased economic benefit by reducing avoidable stays on internal medical services.

Design

As reported elsewhere the assessment design is a before (reactive conventional consultation liaison consultations (CCL)) and after (implementation of the BIT) design, over the same calendar eleven-month period in two contiguous years on the same three general internal medicine units. Metrics are designated as annualized for ease of reporting and comparison when appropriate. There were three separate and distinct nursing units serving 92 beds involved in this study. The results on LOS are reported in Sledge et al. [3] and for convenience the LOS results from that study are given here in Table 1 [3]. Of note, as described, we did not include patients in our main comparison whose LOS was greater than 30 days, as our intervention was designed for patients with acute and evolving problems and who would be discharged within a month. In this analysis BIT patients are compared to CCL patients on the same three units, for the same days of the consecutive years in question, namely August through June.

Population	CCL Period N Mean (SD)	BIT Period N Mean (SD)	Period effect Test Statistic (df) p-value
Patients with psychiatric intervention and LOS<31 days[1]	**535**	**509**	**T=2.86**
	7.29	**6.65**	**(1042)**
	(5.76)	**(5.75)**	**0.004**
All patients with LOS<31 days	5158	5391	F=8.39
	4.98	4.68[2]	(215,457)
	(4.62)	(4.38)	0.0002
All patients	5251	5490	F=6.90
	5.87	5.58[3]	(215,755)
	(8.9)	(9.12)	0.001

[1]Main analysis is highlighted in bold
[2]Average LOS is statistically significant (p=0.0001) between CL and BIT periods. All other pairwise comparisons are not statistically significant
[3]Average LOS is statistically significant (p=0.0006) between CL and BIT periods
Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software All scripts™. Clinical data were collected from a hospital-based and maintained, clinical management system that was carefully monitored and tested against other data sources. Data from this clinical management system (including LOS, diagnoses, and possible confounding variables) were extracted from the electronic medical record and uploaded into a relational database and spreadsheet

Table 1: Descriptive statistics of length of stay (untransformed) and unadjusted statistical analyses of period effects on length of stay (log-transformed) by patient group.

Results

The BIT benefit included the overall reduction in cost of care per case for BIT cases as compared to CCL and the incremental revenue from new cases ("backfill") that could be accommodated due to reduced bed-days associated with BIT LOS reduction. As noted the analysis included only cases with LOS less than 31 days since the characteristics associated with gross LOS outliers were not the primary focus of BIT interventions. Volumes and dollars reported here are rounded for convenience, but the results of calculations shown are based on the non-rounded numbers.

Cost data were accessed from the institution's cost accounting software (Allscripts™) which calculates costs of hospital-billed products and services for all cases including the psychiatric consultation cases of interest here. The revenues did not include the professional fees for the licensed, independent practitioners (almost entirely comprised of MDs in the reported model) who performed the consultations. Actual direct cost per case (i.e., the cost directly associated with patient care, excluding indirect or "overhead" expense) was used in the analysis and were not based on a system of cost-to-charge ratio, but calculated at the product level within each hospital department, using general ledger data along with acquisition costs of raw materials and labor relative value units (RVUs). These are input into calculations to derive the costs of each product/service in each hospital department. The total actual direct cost of hospitalization is the sum of the actual costs of all of the products/services billed in the course of patient care, including room and board, labs, diagnostic imaging, respiratory therapy, pharmacy, etc.

The estimated cost-per-case reduction for BIT cases as compared to CCL cases was calculated in the following manner: initially, since the BIT was implemented in period 3, the year following the CCL period 2, BIT actual direct cost per case was reduced by 3% to account for inflation (This is based on the 3.3% healthcare CPI in BIT period 3[1].)

[1]http://www.forbes.com/sites/mikepatton/2015/06/29/u-s-health-care-costs-rise-faster-than-inflation/#a12fd246ad25

Actual direct cost per case for CCL ($6,760.05) minus BIT ($6,549.78) revealed $210.27 lower cost per case. Multiplying $210.27 by 509 BIT cases in period 3 resulted in $107,027 total cost reduction (not annualized, Table 2).

Incremental revenue associated with new cases that backfilled the bed days opened up by BIT LOS reduction was estimated by calculating the difference between the CCL period average LOS (ALOS) minus BIT period ALOS, resulting in 0.65 days, which was then multiplied by 509 BIT cases to produce 329.37 patient days available for new cases. These patient days were divided by the 5.77 ALOS for all discharges from the BIT units, to produce the volume of 57.08 new cases that were accommodated as a result of the BIT LOS reduction. Assuming that the new cases had the same general adult medical clinical characteristics and payor mix as the other cases admitted to the BIT nursing units at that time, the 57.08 case volume was multiplied by the average net revenue per case for all BIT unit discharges ($12,682), resulting in $723,889 total incremental revenue. This incremental revenue calculation assumes 100% of the backfill potential because demand for inpatient beds at the hospital was extremely high during the BIT period, with hospital census at or over capacity nearly every day (Table 3).

If another institution were to use this model to anticipate incremental revenue associated with implementing a BIT program, the

Population	Cases	Direct cost/case
BIT, LOS<31 Only	509	$6,550
CC, LOS<31 Only	535	$6,760
Total cost per case difference		
BIT minus CL ($210) times 509 cases	($107,027)[1]	

[1]Not annualized
Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software Allscripts™. Clinical data were collected from a hospital-based and maintained, clinical management system that was carefully monitored and tested against other data sources. Data from this clinical management system (including LOS, diagnoses, and possible confounding variables) were extracted from the electronic medical record and uploaded into a relational database and spreadsheet

Table 2: Cost reduction.

Population	Patient days	ALOS	Number of cases
BIT or CL period 3, LOS<31 Only	3,383	6.65	509
CL period 2, LOS<31 Only	3,902	7.29	535
Not BIT nor CL, LOS<31 Only	67,240	4.66	14,416
LOS>31 (i.e., LOS Outliers)	16,476	55.29	298
Total	91,001	5.77	15,758
ALOS difference (7.29 - 6.65)		0.65	
Patient days difference (0.65 ALOS × 509 Cases) CASES)		329.4	
Potential new cases (329.37 days/5.77 ALOS), assuming 100% backfill		57.08	
Net revenue per case		$12,682	
Potential incremental revenue[1]		$723,889	

[1]Not annualized
Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software Allscripts™. Clinical data were collected from a hospital-based and maintained, clinical management system that was carefully monitored and tested against other data sources. Data from this clinical management system (including LOS, diagnoses, and possible confounding variables) were extracted from the electronic medical record and uploaded into a relational database and spreadsheet

Table 3: Caption: incremental net revenue (over 11 months).

following two adjustments could be made to model outcomes associated with alternative assumptions. First, if the institution did not anticipate 100% backfill, the incremental revenue calculation could be adjusted down by reducing the estimated new cases proportionally to the level of backfill expected (Table 4). Additionally, the average net revenue per case could be adjusted to reflect differences in payor mix experienced by different institutions. Our institution serves a population with a high proportion of uninsured/underinsured, including 27% Medicaid on the units served by BIT. An institution with a different payor mix may anticipate a higher (or lower) average net revenue per case, which would raise or lower the estimated total incremental revenue derived from the calculation (Table 5).

For our institution, the benefits associated with the BIT, totaling $830,916, were off-set by the incremental BIT salary costs: one full-time nurse; one full-time social worker; and one half-time psychiatrist, totaling $306,230 (these costs include fringes and indirect expenses associated with the salaries). When expenses were subtracted from benefit, the BIT program still showed an estimated annual benefit (contribution to the margin) of $524,686 for the 11-month study period, annualized to $572,385, estimated yearly benefit (Table 6) for a return on investment of 1.7:1. There was a projected contribution to the margin at all percent occupancy rates above 50%.

Discussion

This financial analysis is an approximation of the costs and benefits but we believe that it is an accurate enough assessment to use to determine if this intervention is economically feasible in other settings. Several features must be considered in terms of its generalizability. This analysis does not include income from revenue of professional fees and the total indirect expense is not fully allocated. We did not include professional fees for two reasons, the most important of which was that an accurate assessment of them was not available due to the failure to bill properly.

The costs reported did not include the direct and indirect expenses of the non-clinical hospital staff needed to support the program (supervisors, administrators, etc.). We reasoned that there would was no significant difference between the two types of programs in these expenses. Our accounting did not include start-up costs of planning or other indirect cost such as office space and computers. These costs vary widely from institution to institution and are minimal for our settings.

Revenue	Backfill %	New cases	Annualized
$723,889	100%	57.08	$789,697
$651,500	90%	51.37	$710,727
$579,111	80%	45.66	$631,757
$506,722	70%	39.96	$552,787
$434,333	60%	34.25	$473,818
$361,944	50%	28.54	$394,848

Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software Allscripts™. Clinical data were collected from a hospital-based and maintained, clinical management system that was carefully monitored and tested against other data sources. Data from this clinical management system (including LOS, diagnoses, and possible confounding variables) were extracted from the electronic medical record and uploaded into a relational database and spreadsheet

Assumptions: BIT consultation is associated with an ALOS reduction of 0.65 days, which opened up 329.37 patient days for back-fill with new cases. New cases could be of any type, with total ALOS=5.77 days, so 329.37 patient days divided by 5.77 results in 57.08 new cases (assuming 100% backfill). At $12,682 average Net Revenue per case, 57.03 new cases would bring in $723,889 incremental Net Revenue for 11 months and $789,697(annualized)

Table 4: Incremental revenue based on bed demand: alternate estimates of incremental net revenue.

Alternate estimates of incremental net revenue	Change to net revenue/Case	Net revenue per case	
$868,667	110%	$13,950	
$829,182	105%	$13,316	
$789,697	**100%**	**$12,682**	**Our institution**
$750,212	95%	$12,048	
$675,191	90%	$11,414	
$573,912	85%	$10,780	

Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software Allscripts™. Net Revenue per case reported for our institution is the average of net revenue from all cases discharged from BIT units during Period 3

Table 5: Incremental revenue based on alternate estimates of average net revenue per case.

Estimated Financial Benefit	11 months	12 months
Incremental Net Revenue from Backfill (filled at 100%)	$723,889	$789,697
Overall Reduction in cost/case for BIT cases including	$107,027	$116,757
Reduction in use of sitters		
Subtotal, Estimated Financial Benefit	$830,916	$906,454
Estimated Additional Expenses	$306,230	$334,069
Estimated Benefit minus Expenses	$524,686	$572,384

Sources/Notes: Authors' analysis of data from Yale New Haven Hospital's cost accounting software Allscripts™. Clinical data were collected from a hospital-based and maintained, clinical management system that was carefully monitored and tested against other data sources. Data from this clinical management system (including LOS, diagnoses, and possible confounding variables) were extracted from the electronic medical record and uploaded into a relational database and spreadsheet.

Table 6: Summary of net financial return on BIT.

We caution that the estimated benefit probably should be considered as a contribution to the margin.

Also not monetized, (in part because they have not been thoroughly measured) are staff and patient satisfaction and health outcome improvements that we believe are represented in the LOS reduction. We also note that a variety of other benefits may be present, such as improvement in patient care and satisfaction, improvement in the quality of all the staffs' experience and subsequent willingness to care for mentally ill patients, and the reduction of staff distress in dealing with patients for whom they are not fully trained and prepared.

Other benefits were measured but not reported which included the value of rapid transfer and admission of patients from non-exempt (from prospective pay reimbursement of Medicare payers) to exempt (our inpatient psychiatric services) settings; thereby filling a bed on the exempt unit faster than we would have done without the transfer. Furthermore, results will vary according to the dimensions of opportunity, i.e., the proportion of people with mental illness and the bed occupancy in the face of increased capacity (without capital expenses except those of the enhanced program). Typically, the more mentally ill patients cared for on medical services concurrently with their medical problems, the more efficient and economically viable the total program will be. Also the size and flexibility of the associated psychiatric service should be considered. Some hospitals have opted not to sponsor or staff inpatient psychiatric services, relying on downstream referrals to partners or other institutions non-aligned. The presence of a proactive psychiatric service embedded in a medical hospitalist service would be an ideal solution for managing the inevitable presence of mental illness in these scenarios.

But the most important advantage is improved patient care and increased staff satisfaction and comfort, improvements we have noticed anecdotally in abundance but have not measured systematically.

Conclusion

Proactive, multi-disciplinary psychiatric consultation has been demonstrated in our system to be effective, well received by patients and staff and, in all instances, not only cost effective but revenue enhancing, particularly in prospective, case rate systems of reimbursement. However, more work on the effect of this intervention on patient outcomes as well as staff and patient acceptance and satisfaction needs to be completed to understand the full impact of a proactive approach.

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