Mobile dental operations: capital budgeting and long-term viability

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Abstract

Objective: The University of Kentucky College of Dentistry (UKCD) runs a large mobile dental operation. Economic conditions dictate that as the mobile units age it will be harder to find donors willing or able to provide the financial resources for asset replacement. In order to maintain current levels of access for the underserved, consideration of replacement is paramount. A financial analysis for a new mobile unit was conducted to determine self-sustainability, return on investment (ROI), and feasibility of generating a cash reserve for its replacement in 12 years.
Methods: Information on clinical income, operational and replacement costs, and capital costs was collected. A capital budgeting analysis (CBA) was conducted using the Net Present Value (NPV) methodology in four different scenarios. Depreciation funding was calculated by transferring funds from cash inflows and reinvested to offset depreciation at fixed compound interest.
Results: A positive ROI was obtained for two scenarios. He depreciation fund did not generate a cash reserve sufficient to replace the mobile unit.
Conclusions: Mobile dental programs can play a vital role in providing access to care to underserved populations and ensuring their mission requires long-term planning. Careful financial viability and CBA based on sound assumptions are excellent decision-making tools.

Introduction

The University of Kentucky College of Dentistry (UKCD) mobile dental program started in 1990 and was conceived out of a need to extend health services to children in rural counties with few dental resources. Currently, the mobile dental program includes three self-contained mobile vans. In addition, the University of Kentucky College of Medicine operates a fourth mobile dental unit.

The oral health status of Kentuckians is considered below average (1,2), and the dental care delivery system faces serious challenges addressing the needs of the residents. The number of dentists in Kentucky is lower compared with national levels, and their distribution across the state is uneven. In 2005, 99 out of 120 Kentucky counties, had a dentist-to-population ratio lower than the national American Dental Association average of 6 dentists per 10,000 population (3,4). The shortage of dentists is particularly critical in the

Appalachian region, where in 2005 the ratio was 3.8:10,000 (3). The number of Kentucky dentists participating in the Medicaid and S-CHIP program is low and the dental safety-net is very limited (1,5,6). Therefore, UKCD's mobile dental operation is a key component in providing access to children not served by the traditional delivery system. Mobile dental units are useful mechanisms in providing dental care to the underserved. Run in conjunction with schools, mobile dental units reduce cost, time, transportation, and bureaucratic barriers (7-9).

Our oldest mobile unit, the Eastern Mobile Unit (EMU), has been in operation for over 15 years. Staffed by a full-time (FT) pediatric dentist and two FT expanded function dental assistants, the EMU provides preventive and comprehensive care to school children who are either uninsured or eligible for the Medicaid and S-CHIP programs. In a typical week during the school year, the EMU's staff renders comprehensive dental treatment 4 days a week and provides only preventive services the remaining day. Schools are usually first visited for diagnostic examination, treatment planning, and preventive procedures including education, topical fluoride application, and sealants. Parents are informed about the treatment needs of the child and needed treatment is completed during subsequent visits. Complex treatment requiring follow-up supervision such as periodontal surgery and molar endodontics are referred to nearby dentists or UKCD clinics. During the summer months when schools are in recess, the EMU travels to a rural county in Kentucky and links with a local health department dental program to provide dental services for children. This opportunity is also utilized to provide dental students with a pediatric experience as part of our community-based dental education program.

A recent survey showed that 13 dental schools throughout the United States operate mobile dental units (10). Similarly, numerous safety net providers in the United States utilize mobile dental units as a mechanism to increase access to underserved populations (11). Previous studies on mobile dental units have described the rationale for their establishment, planning considerations, productivity, and evaluation (8, 12-16). Because of the large cost of capital incurred and decreased cost-effectiveness when compared with a fixed facility, the financial viability of mobile dental operations is always a concern. This issue has been addressed in previous publications (12,13). Douglass concluded that it is unlikely that mobile dental clinic programs serving low-income populations could be self-sustainable without subsidy (12). Griffith concluded that a mobile dental program could be sustained using Medicaid funds and private insurance (13). Historically, UKCD's mobile dental operation has had strong financial support from the Commonwealth of Kentucky, which has established a recurring line in the University of Kentucky's budget. In FY 2006, $160,000 were allocated to the EMU to subsidize its operation. Clinical revenues are generated by billing the Medicaid and S-CHIP programs and through contractual agreements with social agencies. Throughout its existence, many organizations and agencies have supported our mobile operation by providing funding for start-up costs and operations.

The University of Kentucky is a state-supported institution. State-supported dental schools face severe financial challenges that will likely increase (17). It has become clear that the current economic climate will not allow the UKCD to provide the resources to finance asset replacement. Likewise, finding donors willing or able to provide the resources necessary to fund and subsidize a mobile dental operation will be more difficult. However, in order to maintain current levels of access to underserved populations, consideration of replacement is paramount.

The purpose of this study was to perform a financial analysis based on a fee-for-service reimbursement model to determine if a new mobile unit would a) be self-sustainable; b) generate a positive return on investment (ROI) and revenues sufficient to finance its acquisition; and c) create a cash-reserve for its replacement at the end of its useful lifetime. This study differs from those published previously by providing an in-depth analysis utilizing financial and accounting principles in light of current conditions in the public financing of dental care. We believe our analysis will serve as a useful reference for academic institutions, dental administrators, and practitioners considering acquiring a mobile dental unit to expand access to dental services as well as those trying to replace vital program assets. The focus of this paper is strictly financial. Goals, logistical issues, and outcomes are beyond the scope of this analysis.

Methods

The literature uses the word "mobile" in different ways. In many instances, equipment, materials, and personnel are mobilized to a particular site, where a clinic is set up. For the purpose of this analysis, "mobile" refers to a self-contained mobile dental facility housed in a semi-tractor trailer environment. Data on productivity and operational expenses for this analysis was based on historical information from the EMU. Because of the nature of the project and data to be utilized, the University of Kentucky Institutional Review Board waived the requirement for review. Elements included in the analysis were:

Replacement unit

An estimate for a new mobile unit was requested from a manufacturer. The quote featured a mobile unit with similar capacity to the current EMU (three chairs) but equipped with up-to-date features; for example, digital radiology that would increase the efficiency of the operation.

Productivity

Data from FY 2006-2007 including mix of services, billing, collections, payer-mix, and children served by the EMU were collected. In order to reduce the complexity of the analysis, the mix of services, volume, and distribution of patients by insurance status were maintained constant throughout a 12-year time period, which is the useful lifetime of a mobile unit.

Cash outflows

Cash outflows consisted of operational expenses, depreciation funds, and capital expenditures (Tables 1 and 2).

Operational expenses

Operational expenses included direct and indirect costs, which were projected over a 12-year period (Table 1). In the interest of journal space, only totals are presented (Table 2). Detailed data are available from the corresponding author per request. Direct costs included personnel (salary plus benefits), instruments, and supplies. Initial expenses for instruments and supplies were estimated at $9,000 for YR 1, $3,000 for YR 2, and adjusted for inflation from YR 3 and thereafter. Indirect costs included administrative support, driver's services, maintenance and repair, fuel, office expenses, etc. Other indirect costs such as insurance and garaging were not included in our analysis as the former is part of UKCD policy and we do not incur expenses for the latter. All operational expenses, except for diesel, were inflation-adjusted at 3.5 percent annually. Historically, inflation in the past 10 years averaged 2.8 percent, ranging from 1.55 percent up to 3.39 percent. For diesel, we calculated an annual price based on historical information available at the Energy Information Administration (18). Annual price increases were calculated for the time period December 2002 through December 2007 and averaged. An average annual increase of 19 percent was used in our analysis.

Table 1 Operational Expenses

Direct costs
Personnel (including salary and benefits)
Full-time staff dentist (1)
Full-time staff expanded function dental assistants (2)
Instruments and small equipment (3 chairs at $13,000/chair on YR 1)
Dental supplies
Indirect costs
Driver's services
Van's maintenance and repair
Diesel (14 K miles/year)
Administrative salary support (including salary and benefits)
10% director mobile operations
10% support staff
15% billing clerk
General office expenses
Dental equipment maintenance and repair
Registration

Depreciation

Depreciation is a noncash expense that reduces the value of an asset as a result of wear and tear, age, or obsolescence. Depreciation was calculated using the straight-line method for a 12-year period, the time period the mobile will be used to generate revenues. The result of the purchase price of the mobile minus the salvage value or residual value ($20,000) was divided by 12 and allocated in equal amounts over the useful life of the mobile. The depreciation value was utilized to create a cash reserve to be invested that would allow us to replace the mobile unit at the end of its useful life. (Table 2)

Capital expenditures

Quotes for loans were requested from financial institutions to finance the purchase of the mobile unit. Because of the low-risk profile of the institution, credit record, and tax-exempt status, our cost of capital was quoted at 3 percent. Under this particular agreement, the mobile should be paid off in an 8-year period with a $0 down payment (Table 2).

Cash inflows

Cash inflows were calculated based on historical information on clinical income, collections, and state appropriations. For the purpose of our analysis, we utilized four different scenarios (Table 2).

Worst (W)

Current clinical income based on Medicaid fees. Total revenues were increased by 30 percent at the 5th and 10th year – based on historical increases in Kentucky Medicaid fees – with a collection rate of 75 percent.

Existent (E)

Same as Worst (W) but adding state line appropriations adjusted at 3.5 percent annually based on inflation.

Probable (P)

Current clinical income based on Medicaid fees was converted to UKCD's usual customary and reasonable (UCR) fees with a collection rate of 80 percent increasing fees at 3.5

Table 2 Financial Sustainability and Capital Budgeting Analysis (Net Present Value Methodology)

		YR 1 ($)	YR 2 ($)	YR 3 ($)	YR 4 ($)	YR 5 ($)	YR 6 ($)	YR 7 ($)	YR 8 ($)	YR 9 ($)	YR 10 ($)	YR 11 ($)	YR 12 ($)
Cash outflows													
	Operational costs												
	Direct	223,757	194,223	201,021	208,057	215,339	222,876	230,676	238,750	247,106	255,755	264,707	273,971
	Indirect	76,105	79,910	84,065	88,623	93,648	99,214	105,410	112,340	120,128	128,922	138,895	150,255
	Total operational costs	299,862	274,133	285,086	296,680	308,987	322,090	336,086	351,090	367,235	384,677	403,602	424,227
	Depreciation (straight line method)	31,640	31,640	31,640	31,640	31,640	31,640	31,640	31,640	31,640	31,640	31,640	31,640
	Capital expenditures ($399683 at 3% annual × 8 years)	56,117	56,117	56,117	56,117	56,117	56,117	56,117	56,117				
	Total cash outflows	387,619	361,890	372,843	384,437	396,744	409,847	423,844	438,847	398,875	416,317	435,242	455,867
	Cash inflows												
Scenario													
Worst (W)	Medicaid (revenues increase every 5th Yr by 30% with 75% collection rate)	194,124	194,124	194,124	194,124	252,361	252,361	252,361	252,361	252,361	328,070	328,070	328,070
Existent (E)	Worst (W) + State appropriations adjusted annually for inflation	361,392	367,246	373,306	379,577	444,305	451,023	457,976	465,173	472,621	556,039	564,018	572,276
Probable (P)	UKCD's UCR Fees* (adjusted annually for inflation and 80% collection rate)	332,056	343,678	355,707	368,156	381,042	394,378	408,182	422,468	437,254	452,558	468,398	484,792
Best (B)	Probable (P) + State appropriations adjusted annually for inflation	499,324	516,800	534,888	553,609	572,986	593,040	613,797	635,280	657,514	680,527	704,346	728,998
Financial sustainability (Cash inflows – Operational costs)													
FS (W)		(105,738)	(80,009)	(90,962)	(102,556)	(56,626)	(69,729)	(83,725)	(98,729)	(114,873)	(56,607)	(75,532)	(96,157)
FS (E)		61,530	93,113	88,220	82,897	135,318	128,933	121,890	114,083	105,387	171,362	160,416	148,049
FS (P)		32,194	69,545	70,621	71,477	72,055	72,289	72,095	71,378	70,020	67,881	64,796	60,565
FS (B)		199,462	242,667	249,802	256,930	263,999	270,950	277,710	284,190	290,280	295,850	300,744	304,771
Net Present Value (Cash inflows – Total cash outflows)													
NPV (W)	(1,566,735.09)	(193,495)	(167,766)	(178,719)	(190,313)	(144,383)	(157,486)	(171,482)	(186,486)	(146,514)	(88,248)	(107,172)	(127,797)
NPV (E)	434,899.30	(26,227)	5,356	463	(4,860)	47,561	41,176	34,133	26,326	73,746	139,721	128,776	116,409
NPV (P)	(52,802.32)	(55,563)	(18,213)	(17,136)	(16,281)	(15,702)	(15,469)	(15,662)	(16,379)	38,380	36,241	33,156	28,925
NPV (B)	1,948,832.08	111,705	154,910	162,045	169,172	176,242	183,193	189,953	196,432	258,640	264,210	269,104	273,131

* University of Kentucky College of Dentistry Usual Customary and Reasonable Fees. UCR, usual customary and reasonable.

percent annually based on inflation. The collection rate was based on UKCD's current experience with private insurance companies.

Best (B)

Same as Probable (P) but adding state line appropriations adjusted at 3.5 percent annually based on inflation.

Financial sustainability (FS)

Total operational costs were subtracted from projected cash inflows in the four different scenarios (Table 2).

Capital budgeting analysis (CBA)

CBA is a financial tool to evaluate investment in capital assets, i.e., assets that provide cash flow benefits for more than 1 year. Different capital-budgeting decision models can be utilized to determine a course of action and assess program financial performance. For our analysis we utilized Net Present Value (NPV), a financial decision-making tool that accounts for the time-value of money.

Total cash outflows, including operational expenses, depreciation and capital expenditures, were subtracted from cash inflows. The results were utilized to calculate a NPV for each scenario using a 3 percent discount rate. There are different alternatives for defining the discount rate or cost of capital: cost of specific financing source, yield rate on other investments (opportunity cost), and the weighted cost of capital. In this particular case, we chose the same rate we were able to borrow money for the asset acquisition (Table 2).

Forecasted price of subsequent mobile unit

The price of a replacement unit was estimated by calculating the future value of the amount paid today, adjusted at a 3.5 percent annual discount rate, our calculated inflation (Table 3).

Funding depreciation

Funding depreciation is the practice of generating revenues sufficient to cover both cash expenses and depreciation. The depreciation monies were treated as a 12-year annuity invested at a 5-percent compounded annual rate of return. This yield was calculated by averaging returns in a portfolio that included treasury notes (average return 3.6 percent) and stocks (average return 9.4 percent) and adjusted for inflation. The future value of the annuity plus the residual value of the mobile ($20,000) was compared with the forecasted cost of a subsequent mobile unit (Table 3).

Table 3 Future Value Replacement Unit and Depreciation Fund

Future value (FV) mobile (12 years)	
FVn =	$PV(1 + 1)^n$
	$\$399,683\ (1 + 3.5\%)^{12}$
	$604,427
Depreciation fund	
FVAn =	$PMT\sum_{t=1}^{n}(1+i)^{n-t}$
FVAn =	$\$31,640\sum_{1}^{12}(1+5\%)^{12-1}$
FVAn =	$503,622 (83%)
Residual value	$20,000
Cash in hand (12 Yrs)	$523,622 (87%)
Difference FV mobile – Cash in hand =	$80,806

Results

Replacement unit

The fully-equipped mobile unit was priced at $399,683 by the manufacturer.

Productivity

In FY 2006-2007, the EMU program served 1,397 children (52 percent in the comprehensive dentistry and 48 percent in the preventive program). Sixty-eight percent of all children were Medicaid and S-CHIP eligible and 32 percent uninsured. A total of 8,855 services were provided and 85 percent of them were diagnostic and preventive.

Depreciation

Annual depreciation was calculated at $ 31,640 and allocated over the useful lifetime of the unit (Table 2).

Capital expenditures

Annual payment for the unit was calculated at $56,117 and allocated over an 8-year period (Table 2).

Self-sustainability

The proposed mobile unit would be self-sustainable in all scenarios, except Worst (W). The highest profit margin was generated by the Best (B) scenario and the lowest by the Probable (P) scenario (Table 2).

CBA

Two of the scenarios had a positive ROI, Existent (E) at $434,899, and Best (B) at $1.9 M. The Worst (W) scenario had the lowest NPV – $1.5 M, followed by Probable (P): –$52,802 (Table 2).

Forecasted price of subsequent mobile unit

The price of the subsequent unit was estimated at $604,427 (Table 3).

Depreciation funding

The annuity compounded up to $503,622. As the university is a tax-exempt organization, this money is not subject to taxes as unrelated business (19); the money would therefore be fully available to replace the mobile unit. The money set aside as a cash reserve would generate 83 percent of the funds required to replace a mobile unit. This amount became 87 percent when the $20,000 of salvage value was added to the value of the depreciation fund (Table 3).

Discussion

Planning and operating a mobile dental unit requires serious consideration of many logistical factors including staffing, maintenance, repairs, insurance, and commitment of school officials and teachers. From a financial perspective, they require a high capital investment. Therefore, a careful financial analysis must be conducted prior to engaging in any such enterprise, especially when the target population includes the uninsured and individuals covered by public insurance programs.

In our analysis, the proposed mobile would be self-sustainable in three scenarios (E, P, B). In the Worst (W) scenario, the clinical revenues generated by the Medicaid program were not sufficient to cross-subsidize the uninsured patients leading to a negative profit margin. Once the state line item was added, Existent (E) scenario, the mobile unit became self-sustainable. These findings support Douglass' claim for the need of additional subsidies when dealing with low-income populations and stress the dependence of our mobile operation on recurring state appropriations. Subsidies were not required for sustainability when the Medicaid fees were adjusted to commercial levels, such as in the Probable (P) scenario. However, it is important to note that our calculations showed that average UKCD UCR fees were 1.54 times larger than dental Medicaid fees. At a time when states struggle to deal with significantly shrinking revenues, the likelihood of significant increases in Medicaid reimbursement is slight.

The CBA sought to evaluate the investment from a purely financial perspective. A positive ROI was obtained only for two of the scenarios, Existent (E): NPV $434,899 and Best (B): NPV $1.9 M. Similar to our financial sustainability assessment, both scenarios would require a continuous commitment from the state in maintaining its line appropriation. Although the ROI in the Probable (P) scenario was negative, when the collection rate was increased from 80 percent to 82 percent (calculation not shown), the NPV became positive. Therefore, increasing Medicaid fees to commercial levels would be the only mechanism to self-fund the subsequent mobile unit if subsidies were not available.

The depreciation fund reinvested at an annual 5 percent yield resulted in 83 percent of the estimated cost of a subsequent mobile unit and 87 percent when the residual value was added. Although a 5 percent return can be adjusted upwards using a riskier asset allocation profile over a long-term investment (12 years), we chose a conservative rate of return for our analysis. We consider the amounts generated by the depreciation fund very significant, stressing the importance of long-term planning.

The Probable (P) scenario was included in our sensitivity analysis to determine the effect of increased Medicaid fees on sustainability and viability of replacement. While from a fiscal perspective this increase would result in additional expenditures for dental care at the state level, additional providers might become participating providers in the Medicaid program as occurred in Georgia, Michigan, South Carolina, and Tennessee resulting in increased access to care (20).

Diesel expenses were adjusted at a 19 percent rate, which would seem extremely high based on long-term historic valuations in the United States. However, based on data from the Energy Information Administration, the price on diesel has increased by 134 percent in the past 5 years, growing at a faster pace than the price of gasoline. Though the environmental consideration is very important, from a purely financial perspective, acquiring a fuel-efficient vehicle would add to the initial capital requirement and the tax-breaks associated with the purchase are irrelevant in our particular situation as the University of Kentucky is a tax-exempt organization.

There are several limitations in this analysis, especially as we attempted to forecast cash inflows and outflows into the future. Projected cash flows from clinical income can vary depending on the productivity of the dentist and auxiliary personnel, number of days of operation, mix-case of services, number of uninsured children served, changes in reimbursement from Medicaid, etc. By the same token, cash outflows are bound to changes in operational costs as well as changes in the economy. Financial sustainability and ROI are sensitive to changes in these variables.

There are different views on the issue of funding depreciation. Under current accounting principles, depreciation addresses only the original cost of the asset. We believe that it is necessary to recognize the cost of using assets and establishing reserves to provide for their replacement, especially as the competition for philanthropic and public health dollars becomes tighter and state support for dental schools continues to decrease.

Mobile dental services are, by definition, episodic in nature. Ideally, they should be visualized as the spearhead of development, preparing communities for the ultimate provision of more permanent services, i.e., a fixed dental facility. However, in many communities, this may not always be possible. In these particular situations, mobile dental programs can play a vital role in providing access to care to underserved populations and ensuring this mission requires long-term planning. Careful financial viability and capital budgeting analysis based on sound assumptions are excellent decision-making tools. Their value can be improved if the analysis is presented in worst-case, most likely case, and best-case scenarios.

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