The Cost of Academic Dentistry: How Will We Pay the Bill?

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Abstract: As this Summit addresses the value of the school of dentistry to its parent institution, clearly this value cannot be assessed by cost alone. However, as extraordinary expenditures are required to meet infrastructure and equipment needs of the school, the need for change is inevitable. As long as we continue to think in terms of the traditional four-year curriculum with its heavy staffing requirements to deliver information, and in terms of clinical practice programs conducted for the most part in-house, there is little opportunity to better manage the cost of dental education. Alternatives are discussed based on revenue and expense analyses from the most recently published financial statistics for dental education from both the American Dental Association and American Association of Dental Schools. Strategies are presented as either changes in the first two years of the predoctoral program or changes in the clinical component of the predoctoral program, with emphasis placed on partnerships with other dental schools and with organized dentistry, as suggested by Machen. It is concluded from a review of previous studies that approaching the task of reducing the cost of dental education within paradigms that allow for only marginal changes would be an exercise in micro-management and could be accomplished by simply rearranging what had been written. By extending our thoughts beyond the limitations of the traditional four-year curriculum, we have attempted to present strategies that could potentially have a significant effect upon the cost of academic dentistry.

This summit addresses the value of the school of dentistry to its parent institution. We believe that overall cost is an important component of value, and paying the bills an important consideration that involves all stakeholders, including the university, government, students, faculty, staff, patients, and alumni. A reasonable assumption is that, so long as the school of dentistry is competently operated, is within budget, and is functioning in accord with the mission of the university and its own mission, then the cost to the university is acceptable. Clearly, the value of the school of dentistry to the university and/or academic health center as measured by the quality of instruction, research, service, and the contribution of its graduates to the health of society cannot be assessed by cost alone. The true value of the school of dentistry could be tested when extraordinary expenditures are required to meet infrastructure and equipment needs of the school, such expenses in other units of the university, or other programs identified for emphasis and enhancement. This is not a time for complacency or to accept the *status quo*.

The publication *Dental Education at the Crossroads* must serve as a primer to inform contemporary efforts to address the issues raised in that study and as a guide for reformers. Chapter 7, "Dental Schools and the University," is especially germane here in that part of the chapter deals with financing dental education. The narrative explains, "Because financing has been identified as such a crucial factor, the next section of this chapter considers the financial position and options of dental schools." Further, the chapter prophetically states: "It does not promise easy answers."[1]

By presenting data in different ways or reallocating from here to there small pieces of the budget, we are not going to do any better than Douglas and Fein[2] nor the Institute of Medicine (IOM) study. We could all do with more money to improve or increase what we have traditionally accepted as the way to conduct business. We also would expect that the majority of deans would identify financial concerns as a major issue. Again, adjusting at the margins will have marginal effects on our budgeting and finance. We all end up at the end of the year balancing income and expenditures and, no matter how these are apportioned, we move on to the same process for the next year.

On the basis of the evidence, and except in the cases where schools have closed, the cost of dental education rocks along at its expensive level, at least for

now. It is conceivable that every effort has been made by dental education with its collective wisdom to manipulate budgets, spurred on by the discomfort of being the "most expensive program on campus or the academic health center."[1]

Within the existing structure of the four-year curriculum, it is likely that little else can be done to alter the overall cost of dental education. Major revenue streams are set, and it is doubtful they will change greatly in the future. We believe that increases in tuition to create a significant increase in revenue will not occur, nor will states or universities increase their revenues to dental schools. Clinic income and research indirects similarly will not change much for the foreseeable future.

As long as we continue to think in terms of the traditional four-year curriculum with its heavy staffing requirements to deliver information, and in terms of clinical practice programs conducted for the most part in-house, likewise with heavy staffing requirements, there is little opportunity to better manage the cost of dental education.

Numerous caveats are presented in the IOM study, in reference to finances and strategies aimed at affecting the cost of dental education. In particular, the statement is made that "no strategy should be adopted without careful analysis of its implications for the education, research, and patient care missions of the dental school."[1]

With this in mind, this paper presents two strategies that we believe could significantly reduce the cost of dental education while improving the overall operation of the educational programs with significant changes and perhaps enhancement of program effectiveness. This process requires us to take risks. These strategies are driven in part by one of the recommendations made in Chapter 7 related to potential financing strategies: "rethinking basic models of dental education and experimenting with less costly alternatives."[1] We agree in part with the conclusion of the IOM study that there is no "silver bullet" for solving the financial problems related to the cost of dental education. But we believe that, by moving away from the traditional paradigm, some opportunities do present themselves.

Costs and Financing of Dental Education

Before presenting some strategies to reduce the cost of dental education, we should consider some updated financial data that has become available since the publication of the IOM study. The Douglas and Fein[2] longitudinal financial analysis provided the financial basis for the IOM study. The conclusions and recommendations from this report have been the basis for dental education's introspection and self-analysis over the past several years. In this paper, the American Dental Association's[3] financial statistics for dental education will be examined from 1991 through the most recently published information. This is shown in a series of tables, which look at both the revenue and expense sides of dental education costs and financing.

Revenue Analysis

Tables 1 and 1A show how the sources of revenue to all dental education have changed since 1991. This information is then subdivided and shown for public schools in Tables 2 and 2A and for the combined categories of private and private state-related schools in Tables 3 and 3A. Rather than being adjusted for inflation, this data is far more revealing when we look at the proportional changes in the total.

The category of tuition and fees is either up or up dramatically depending upon who is paying. During a period when most dental schools supposedly were attempting to keep tuition and fee increases to a minimum—that is no greater than inflation—we see that they have increased by half again. As a proportion of our total support, tuition has increased from 24.8 percent to 30.3 percent. Before fingers are pointed at the private schools, look at Tables 2 and 3, which indicate that public school tuition is up by 57 percent, whereas private tuition is up "only" 43 percent.

The public institutions now generate 16.4 percent of revenue from the tuition and fees category, up from 11.9 percent in 1991, while for private schools the category has risen from 52.1 percent to 55 percent. The recent increases at the public schools are even more dramatic when we note that Machen,[4] when looking at the period from 1983 to 1993, found that tuition at public schools had not increased as a percentage of total revenue. On the other hand, Myers and Zwemer[5] noted increases in both total tuition and fees as well as a percent of total revenue.

Changes in the category of patient care or clinic revenue have been as dramatic as those in the tuition and fees category. Overall clinic revenue has increased by 50.9 percent for all schools, with the private schools leading the way with a 54.1 percent increase while the public schools increased by 48.7 percent. The private

Table 1. Revenue sources for dental education changes in total 1991-1996 all schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Tuition and Fees	$221,177	$326,343	$105,166	47.5%
State and Local Governments	$426,086	$388,154	$(37,932)	-8.9%
Federal Government	$10,924	$9,455	$(1,469)	-13.4%
Patient Care	$153,211	$231,141	$77,930	50.9%
Gifts and Endowment	$28,877	$46,522	$17,645	61.1%
Recovery of Indirect Costs	$24,841	$34,253	$9,412	37.9%
Other	$25,815	$39,612	$13,797	53.4%
Total	$890,931	$1,075,480	$184,549	20.7%

Table 1A. Revenue sources for dental education changes in proportion 1991-1996 all schools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Tuition and Fees	$221,177	24.8%	$326,343	30.3%
State and Local Governments	$426,086	47.8%	$388,154	36.1%
Federal Government	$10,924	1.2%	$9,455	0.9%
Patient Care	$153,211	17.2%	$231,141	21.5%
Gifts and Endowment	$28,877	3.2%	$46,522	4.3%
Recovery of Indirect Costs	$24,841	2.8%	$34,253	3.2%
Other	$25,815	2.9%	$39,612	3.7%
Total	$890,931	100.0%	$1,075,480	100.0%

Table 2. Revenue sources for dental education changes in total 1991-1996 public schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Tuition and Fees	$71,797	$112,739	$40,942	57.0%
State and Local Governments	$396,902	$361,740	$(35,162)	-8.9%
Federal Government	$1,435	$2,126	$691	48.2%
Patient Care	$92,474	$137,527	$45,053	48.7%
Gifts and Endowment	$10,274	$21,739	$11,465	111.6%
Recovery of Indirect Costs	$19,154	$26,610	$7,456	38.9%
Other	$12,387	$24,440	$12,053	97.3%
Total	$604,423	$686,921	$82,498	13.6%

Table 2A. Revenue sources for dental education changes in proportion 1991-1996 public schools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Tuition and Fees	$71,797	11.9%	$112,739	16.4%
State and Local Governments	$396,902	65.7%	$361,740	52.7%
Federal Government	$1,435	0.2%	$2,126	0.3%
Patient Care	$92,474	15.3%	$137,527	20.0%
Gifts and Endowment	$10,274	1.7%	$21,739	3.2%
Recovery of Indirect Costs	$19,154	3.2%	$26,610	3.9%
Other	$12,387	2.0%	$24,440	3.6%
Total	$604,423	100.0%	$686,921	100.0%

Table 3. Revenue sources for dental education changes in total 1991-1996 private and private state-related schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Tuition and Fees	$149,380	$213,604	$64,224	43.0%
State and Local Governments	$29,184	$26,415	$(2,769)	-9.5%
Federal Government	$9,489	$7,329	$(2,160)	-22.8%
Patient Care	$60,737	$93,613	$32,876	54.1%
Gifts and Endowment	$18,602	$24,784	$6,182	33.2%
Recovery of Indirect Costs	$5,688	$7,643	$1,955	34.4%
Other	$13,428	$15,171	$1,743	13.0%
Total	$286,508	$388,559	$102,051	35.6%

Table 3A. Revenue sources for dental education changes in proportion 1991-1996 private and private state-related schools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Tuition and Fees	$149,380	52.1%	$213,604	55.0%
State and Local Governments	$29,184	10.2%	$26,415	6.8%
Federal Government	$9,489	3.3%	$7,329	1.9%
Patient Care	$60,737	21.2%	$93,613	24.1%
Gifts and Endowments	$18,602	6.5%	$24,784	6.4%
Recovery of Indirect Costs	$5,688	2.0%	$7,643	2.0%
Other	$13,428	4.7%	$15,171	3.9%
Total	$286,508	100.0%	$388,559	100.0%

schools have increased patient care income from 21.2 percent to 24.1 percent of total income, while the public schools have gone from 15.3 percent to 20 percent. For all schools, the proportion has increased from 17.2 percent to 21.5 percent.

While it is clear that dental schools could not function without the income generated from patient care, it is a notion, a concept, and, in fact, a way of operating that has always been troubling. Clinical patient care is similar to cooperative education, where students alternate semesters of formal education with practical working experience, but they differ in that the "cooperative employer" pays the student, while the "cooperative patient" pays the school rather than the student. More about this later.

State and local government support has declined substantially over the examined period. While a proportionate drop due to increased efforts at generating tuition and clinic revenue was expected, the absolute decline is somewhat surprising. State support for all dental education has declined $38 million or 8.9 percent, which represents a drop from 47.8 percent to 36.1 percent of the total. Not surprisingly the majority of this decrease has been from public schools, $35 million, where the proportion of support has declined from 65.7 percent to 52.7 percent. Because of the much lower base, the state support decrease, both absolute and proportionately, has been far less dramatic at the private schools.

Douglas and Fein[2] reported that state support was 36.0 percent in 1973. At the same time, combined tuition and clinic support was at 26.4 percent. By 1983, the state share had increased to 46.6 percent with tuition and clinic income rising to 36.9 percent. By 1991, the respective proportions were 42.4 percent and 37.3 percent, a relatively insignificant change considering dental education's turmoil during that era. Now, however, we find that the combined student-generated support of tuition with clinic revenue has increased to 51.8 percent while state support has declined to only 36.1 percent of the total.

The reason both student and state support was so low in 1973 is that the federal government was supporting 30 percent of the dental education enterprise. By 1983, this percentage had declined to 10.1 percent, and it continues to fall. When viewing only "educational revenue" as portrayed in the ADA report[3]—and called "operating revenue" in the IOM study—the funds expended for sponsored research are omitted. In this light, the federal government is a virtual non-entity in the support of dental education. Total revenue from the federal government has declined by 13.4 percent to .9 percent of total support. While the public schools have shown a large percentage increase, the dollar change, most of which comes from Ryan White funds, is insignificant. The private schools have actually lost federal support both in absolute and relative terms.

Although sponsored research support is not considered operating or educational revenue, the revenue from the recovery of indirect costs (i.e., overhead) is shown. This should be closely tied to the research activity. This source, while not large, has shown a healthy improvement both in absolute and relative terms. Both the public and private sectors have shared equally in the absolute growth; however, the private schools have remained constant as a proportion of income while the public schools have increased slightly.

Growth in this revenue source is encouraging, but we must be mindful of two points. First, virtually all of these funds subsidize the research mission of the dental school. In fact, many financial administrators argue that the total of sponsored research and overhead revenue equals only 80 percent of research expense. Second is the very small amount in the "recovery category." It is even smaller than the ubiquitous "other" category.

At this point it is essential to pause for a moment to reflect on these major sources of revenue and what they are telling us. Yes, dollars do talk, and in this case they are giving us a loud and clear message. Dental education, the education and training of the future dentists of the nation, is not a societal priority. While dollars may not be able to answer why, they clearly tell us that if individuals wish to become dentists they will have to bear a higher proportion of the educational cost than did their predecessors. Dental education is becoming less of a societal commodity and more of a personal one. The taxpayers, administrators, and bureaucrats are telling our students: if you wish to become a dentist, you will have to pay for it, not only in terms of tuition, but also in terms of "labor," providing treatment to patients for fees that subsidize the educational process.

The IOM study stated that the problems facing dental education are not merely the concern of the schools and universities, but also the concern of the profession and of society generally. The IOM committee had as one of its guiding principles that a qualified dental workforce is a valuable national resource and that support for the education of this workforce has come and must continue to come from both public and private sources. To date, society and its funding representatives have not heeded this principle.

Table 7. Median student dental clinic revenue as a percentage of total dental school revenue from all major sources

Type of School	1980	1990	1993	1994	1995	1996
All Schools	11.2%	11.3%	12.4%	12.8%	13.7%	13.3%
Public	8.1%	8.7%	9.8%	10.4%	11.7%	10.9%
Private	15.9%	16.3%	18.7%	18.8%	18.2%	17.3%
Private-State Related	N/A	15.1%	14.4%	14.4%	15.4%	17.5%

The final category of revenue, gifts, and endowments is the fastest-growing source of support. These revenues have increased over 60 percent for all schools, with the public growth over 111 percent. While not an immense sum, these revenues provide the all-important flexibility needed to operate any organization. They are also "Dean dollars," for many cases these funds and the growth in these funds can be directly tied to the fundraising efforts of deans. Of all the roles these individuals expected to encounter when they began their careers in education, I am sure fundraising was not one of them. They are to be commended for their excellence in this activity.

Patient Care Revenue: A Closer Look

The total patient care revenue reported by the ADA[3] includes an "intramural" component. This is the revenue generated by the faculty, which is returned to the school for general-purpose use. (Any funds used strictly to support the faculty practice activity are excluded from the report.) In FYE 1996, this intramural revenue represented 27 percent of all clinic revenue, ranging from a high of 33 percent at public schools to a low of 14 percent at private state-related schools. In order to see the clinic revenue generated only by students we must turn to the *Survey of Clinic Fees and Revenue: Summary Report*[6] published by the American Association of Dental Schools.

Table 7 is excerpted from that report. The Association appropriately concludes that "there has been little change over the past fifteen years in the mean of student dental clinic revenue as a percentage of dental school revenue from all major sources."

If the AADS conclusion is appropriate, we must reconcile this with the ADA data showing that Patient Care Revenue has increased by 50.9 percent over this period and from 17.2 percent of total revenue to 21.5 percent of this total. The first and obvious source is faculty practice income. According to the ADA,[3] this revenue source has increased by 52.3 percent during the same period when student-generated revenue has increased by 50.3 percent. As a proportion of total patient care revenue, that generated from faculty practice has changed from 26.7 percent to 27.0 percent. Clearly an insignificant change.

Because of changes in reporting format, it is more difficult to track the changes in student-generated revenue; however, it appears that the increases are predominately from the various graduate programs. Even at this level it would appear that increases are more a result of increasing numbers of programs and increasing numbers of residents in existing programs rather than productivity improvements. This growth in the number of residents is greatest in the non-specialty-advanced programs. A comprehensive analysis of the productivity of these programs would be a valuable addition to the dental education literature.

The AADS report shows the following revenue per senior student:

Range	Public	Private	Private State-Related
High	$31,225	$24,021	$22,109
Median	$11,063	$11,641	$11,617
Low	$5,335	$2,717	$6,913

This indicates a very significant range of revenue generated per senior student from $31,225 to $2,717. The same range exists for reported graduate programs. The median for all senior students was $11,216. To attempt to measure the productivity of these students, assume that each senior student has two hundred days devoted to patient care and that there are two clinic sessions per day, so that each senior has four hundred sessions which can be devoted to patient care. With these assumptions, the productivity would be as follows:

Senior Students	Total Revenue	Number of Sessions	Revenue Per Clinic Session
Highest Producer (Public)	$31,225	400	$78.06
Median Producer (All)	$11,216	400	$28.04
Lowest Producer (Private)	$ 2,717	400	$ 6.79

If each clinic session were three hours, then the hourly productivity of these students would be:

	Revenue/Hour
High	$26.02
Median	$9.35
Low	$2.26

Table 4. Costs of dental education changes in total 1991-1996 all schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Instruction-Clinical	$322,638	$354,582	$31,944	9.9%
Instruction-Other	$122,234	$134,211	$11,977	9.8%
Instruction-Total	$444,872	$488,793	$43,921	9.9%
Administration	$73,216	$90,161	$16,945	23.1%
Patient Care	$202,946	$274,652	$71,706	35.3%
Physical Plant	$85,452	$84,835	$(617)	-0.7%
Library, etc.	$33,114	$35,531	$2,417	7.3%
General University Overhead	$92,151	$105,564	$13,413	14.6%
Other	$14,083	$21,317	$7,234	51.4%
Total	$945,834	$1,100,853	$155,019	16.4%

Table 4A. Costs of dental education changes in proportion 1991-1996 all schools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Instruction-Clinical	$322,638	34.11%	$354,582	32.2%
Instruction-Other	$122,234	12.92%	$134,211	12.2%
Instruction-Total	$444,872	47.03%	$488,793	44.4%
Administration	$73,216	7.74%	$90,161	8.2%
Patient Care	$202,946	21.46%	$274,652	24.9%
Physical Plant	$85,452	9.03%	$84,835	7.7%
Library, etc.	$33,114	3.50%	$35,531	3.2%
General University Overhead	$92,151	9.74%	$105,564	9.6%
Other	$14,083	1.49%	$21,317	1.9%
Total	$945,834	100.00%	$1,100,853	100.00%

Table 5. Costs of dental education changes in total 1991-1996 public schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Instruction-Clinical	$225,624	$248,211	$22,587	10.0%
Instruction-Other	$86,743	$93,021	$6,278	7.2%
Instruction-Total	$312,367	$341,232	$28,865	9.2%
Administration	$40,268	$48,323	$8,055	20.0%
Patient Care	$141,887	$175,107	$33,220	23.4%
Physical Plant	$54,842	$54,660	$(182)	-0.3%
Library, etc.	$23,755	$25,650	$1,895	8.0%
General University Overhead	$61,800	$58,178	$(3,622)	-5.9%
Other	$6,165	$13,072	$6,907	112.0%
Total	$641,084	$716,222	$75,138	11.7%

Table 5A. Costs of dental education changes in proportion 1991-1996 public achools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Instruction-Clinical	$225,624	35.19%	$248,211	34.7%
Instruction-Other	$86,743	13.53%	$93,021	13.0%
Instruction-Total	$312,367	48.72%	$341,232	47.6%
Administration	$40,268	6.28%	$48,323	6.7%
Patient Care	$141,887	22.13%	$175,107	24.4%
Physical Plant	$54,842	8.55%	$54,660	7.6%
Library, etc.	$23,755	3.71%	$25,650	3.6%
General University Overhead	$61,800	9.64%	$58,178	8.1%
Other	$6,165	0.96%	$13,072	1.8%
Total	$641,084	100.00%	$716,222	100.00%

Table 6. Costs of dental education changes in total 1991-1996 private and private state-related schools

	FYE Jun-91	FYE Jun-96	Change $$$	Change %%%
Instruction-Clinical	$97,014	$106,371	$9,357	9.6%
Instruction-Other	$35,491	$41,189	$5,698	16.1%
Instruction-Total	$132,505	$147,560	$15,055	11.4%
Administration	$32,947	$41,838	$8,891	27.0%
Patient Care	$61,028	$99,545	$38,517	63.1%
Physical Plant	$30,610	$30,175	$(435)	-1.4%
Library, etc.	$9,357	$9,881	$524	5.6%
General University Overhead	$30,351	$47,386	$17,035	56.1%
Other	$7,919	$8,245	$326	4.1%
Total	$304,717	$384,630	$79,913	26.2%

Table 6A. Costs of dental education changes in proportion 1991-1996 private and private state-related schools

	FYE Jun-91	% of Total	FYE Jun-96	% of Total
Instruction-Clinical	$97,014	31.8%	$106,371	27.7%
Instruction-Other	$35,491	11.6%	$41,189	10.7%
Instruction-Total	$32,505	43.5%	$147,560	38.4%
Administration	$32,947	10.8%	$41,838	10.9%
Patient Care	$61,028	20.0%	$99,545	25.9%
Physical Plant	$30,610	10.0%	$30,175	7.8%
Library, etc.	$9,357	3.1%	$9,881	2.6%
General University Overhead	$30,351	10.0%	$47,386	12.3%
Other	$7,919	2.6%	$8,245	2.1%
Total	$304,717	100.00%	$384,630	100.00%

These are obviously very low rates of productivity. Even if our estimate of total annual clinic sessions were reduced by half (and we would then need to seriously question where senior dental students were spending the balance of their time), this would only raise the hourly production for a student in the median school to $18.70. We will return to these very low productivity rates once we have completed our analysis of how this revenue is expended.

Expense Analysis

When we consider the costs of dental education over this period, the one remarkable statistic is the lack of any remarkable statistic. This information is shown in Tables 4-6 and 4A-6A. Whether analyzing clinical or total instruction, school or university administration, public, private, or all schools, most statistics seem to be chugging along at the same rate—around the rate of inflation for the period. The fastest growing trend is that of "other" (a category that we bean counters abominate), but an increase from 1.0 percent to 1.3 percent is hardly remarkable.

One trend, which is somewhat difficult to discern, is the ability of dental education to spend more than its revenues. In a paper delivered to the Council of Deans in 1984, members of that group were congratulated for their ability to consistently spend beyond their means. Even though the trend continues, the most recent survey from the American Dental Association[3] notes that, while expenses continue to exceed revenue, the gap is being closed so that the rate of overexpenditure is down to 1.9 percent for FYE 1996 ($24 million) from the high of 5.9 percent in 1992 ($61 million). A disturbing trend is the decline in both absolute and relative terms for all schools in expenditures for physical plant. In an era of rapidly advancing technology such as lasers, digital radiography, intraoral cameras, and sophisticated clinical and laboratory simulation equipment, our investment in physical plant and equipment, upon which we are extremely dependent, should be rising substantially.

Table 8. Increases in average educational debt survey of dental school seniors 1991-92 to 1996-97

	From 1991-1992	To 1996-97	Total Increase	Percent Increase
All Schools	$45,550	$81,688	$ 36,168	79.3%
Public Schools	36,380	66,669	30,289	83.3%
Private State-Related	56,700	93,583	36,883	65.1%
Private	63,900	113,128	49,228	79.0%

One final expense category of note is that of general university overhead. This category has declined in dollars and as a proportion of total expense in public schools, yet has increased by more than 56 percent at private schools. It has also increased as a proportion of total expenses by about the same percent as clinical instruction has declined. While speculation about this change may be uninformed and unwise, it does warrant investigation in the appropriate schools.

Student Debt

The most highly publicized financial statistic concerning the cost or financing of dental education is the growth of student debt. The American Association of Dental Schools reports in its *Survey of Dental Seniors*[7] that "since 1990, average educational debt has increased nearly 8 percent per year, substantially exceeding the rate of inflation." During the period of this study, student debt has grown as shown in Table 8.

At the same time, according to Myers and Zwemer,[5] dentist net income has dropped from 44 percent of gross to just over 33 percent. They report that repayment of 1997 debt levels will require annual net incomes ranging from $119,576 to $178,206. With the overhead rates they report, gross incomes will need to range from $360,000 to $540,000. Also keep in mind that the additional debt incurred during graduate training is not reported. Myers and Zwemer[5] conclude that the profession faces a serious economic problem concerning the indebtedness of its graduates and that even average levels of debt make it virtually impossible for a graduate to consider a career in dental education. However, at the same time the educational and practicing communities raise great concerns over debt levels, we also raise tuition and fees as shown in the earlier analysis.

The group seemingly unconcerned about debt levels is future members of the profession, in that high-quality applications continue to arrive at our doors at unprecedented rates. In a decidedly nonscientific survey of the senior class at Virginia Commonwealth University, we found that, although all students expressed concern over debt levels, they indicated that this debt would not deter them from choosing the profession again and also felt that debt would not be an impediment to future applicants.

Suggested Approaches

Most suggested strategies for dealing with the cost and financing of dental education use what I term the "little bit" approach. That is, if we do a little bit of this and a little bit of that, our financial problems become manageable (they never become solved). The classic strategy suggested by Machen,[4] Douglas and Fein,[2] Tedesco,[8] and the IOM study[1] is to increase the productivity, quality, efficiency, and profitability of patient care activities. Hunt et al.[9] also noted that the most likely source for increased revenue is patient care.

Treating patients is what we do and do best, so emphasis here is logical. But what if we cannot improve the productivity, quality, efficiency, and profitability of patient care activities? Solomon et al.[10] found only one service where clinical revenue exceeded total cost. In discussing a profit-volume model for analyzing clinics, DuBois[11] suggests that because of the low fee schedule many, if not most, clinical services provided by students do not cover their variable cost let alone contribute to fixed cost and profit. If this is the case, we are in the classic manufacturing quandary of losing a little on each unit, but trying to make up for it in volume. To expect that dental students can provide a profitable service is no more realistic than expecting students in the arts to support their educational institutions by selling their art or compositions or business students to support their schools by consulting.

Another suggestion is to rethink basic models of dental education and implement less costly alternatives. When we look at the expense side of our equation, it is obvious that we have not been able to engage in such rethinking. It seems that there is only one long-range and sustainable less costly method. However, the Northwestern approach cannot be recommended to any other school.

The generation of externally funded research is another popular suggestion to enhance the dental school's revenue base. Yet this begs the question once raised by the folk singers, "where have all the researchers gone?" The decline and demise of the dentist scientist program has left a serious gap in our training programs. The first professional and specialty training programs are primarily practitioner-oriented, lacking much focus on scientific inquiry and research methods. There is also the disturbing notion presented previously that funded research, while enhancing school and university prestige, often outspends its income.

Machen[12] suggests three alternatives for dental education. One, to go it alone, was not recommended. This is unfortunate because, while it is a very bad idea, it is what we do best. Whether admissions, curriculum, patient care, or administration, we often do our own thing and do it well. The other suggestions were for closer alignment with organized dentistry and with the academic health center. Yet organized dentistry with Past President Ten Pas[13] as spokesman expresses concern that such integration may cause a dilution of the program and that dentistry will rarely win if decisions are dominated by medicine. The old 800-lb. gorilla growls again. Probably the most telling argument for being a more closely integrated part of the academic health center came from Aiden Stephens, the last dean of Loyola's dental school, who expressed the belief that the school would still be open if it had been an integral part of the fabric of the university.

Strategy I: Changes in the First Two Years of the Predoctoral Program

The traditional dental curriculum is typically four years in length, requires full-time attendance, and results in the education of a competent graduate. The first two years are spent predominantly acquiring knowledge in the basic, behavioral, and clinical sciences delivered mostly in a lecture format and complemented by some fundamental clinical experiences and a varying degree of preclinical laboratory instruction.

Except in a few cases where problem-based learning is the pedagogical mode, most dental school curriculums are similar in content and distribution of hours among the various subject/discipline areas. This is driven for the most part by time allocation, the finite nature of knowledge in some areas, accreditation standards, and tradition.

The point is that at 9:00 A.M. on Monday morning there is a high probability that there are fifty-five lectures being delivered to 1,000 dental students in gross anatomy, or biochemistry, or introduction to preventive dentistry, all very similar in content throughout the United States. Often multiple faculty can be involved in teaching one or more of the many courses in the curriculum, making it easy to understand why each school has so many faculty members resulting in very high salary and wage budget allocations.

To digress for a moment, we are all very much aware of the seemingly endless advances being made in the world of information technology and the impact this is having and will continue to have on the delivery of educational programs.[14] Through use of this technology, the development of a nationally available den-

tal curriculum is not an illusion at this time. One of us has alluded to this possibility in a recent presentation[15] in which reference was made to an interesting article by Halfond.[16]

Interestingly, many dental schools have made certain parts of their curriculums available to their students via local area networks (LAN) and/or the Internet. Syllabi are published and accessible on home pages at some institutions, and more extensive presentations of some curriculums, including lecture notes and references, are also available. CD-ROM technology has also been used to present curriculum materials and to develop authoring programs for interactive programs, i.e., DISC (Dental Interactive Simulation Corporation).

Taking this concept several steps further, we can envision that through a cooperative process the intellectual capacity of dental medicine involving the basic, behavioral, and clinical sciences could develop the "best practices curriculum" in dental education, which would be nationally (and universally) available through a "virtual dental school" via the Internet and/or by using CD-ROM products. Both of these technologies would be complemented by e-mail question-and-answer technology, real-time interactive potential, or some other form of support. The best practices curriculum would utilize multimedia and, if it were made available on the Internet, would be linked to reference materials. It would also require password access and be secure. We realize that the best practices curriculum will not be available tomorrow; however, several pieces are currently available, and new resources are being added daily at all levels of education.

Projecting ahead, one can speculate about the potential impact that a nationally developed dental curriculum would have on the cost of dental education to the institution and to the student. Before discussing these effects, we will make several assumptions:

1. That a national curriculum would prepare students with the knowledge and skills to support their beginning clinical practice.
2. That an intense simulation experience would be completed prior to beginning patient care.
3. That students would not be required to be present at the dental school to complete the national curriculum. They would, however, have been matriculated.
4. There could be several variations of the national curriculum model, just as there are probably fifty-five variations of the current dental education program. Some examples could be:
   - Partial use of the national curriculum;
   - Use of a distance education model using real time delivery;
   - Presence of research faculty and their role in the educational process; and
   - Involvement of clinicians in continued reinforcement of curriculum content in a competency-based curriculum.
5. That development of the national curriculum would be a shared expense and experience involving several schools and sponsored in part by grants and contracts from outside agencies. Updating the curriculum would also be an ongoing, shared experience and expense.
6. That the clinical practice component of the curriculum would continue partially in the school of dentistry depending upon the adoption of the strategies for the clinical practice program discussed later.

Cost Related to Faculty

In the broadest of terms, the potential exists to significantly reduce the number of faculty involved in the delivery of the basic, behavioral, and clinical sciences curriculum. These courses would be delivered electronically, and it is suggested that one faculty member per discipline could adequately handle the question-and-answer requirements and the discussions for each course. The faculty member could complete those duties and spend the remaining time developing course updates, preparing examinations (though this would likely be handled nationally), and conducting research. In instances where the basic sciences are taught by dental faculty, there could be sizable cost savings to the school as only one faculty member would be needed per discipline. All these faculty could be housed in one multidisciplinary department, thus maintaining a critical mass for research and for reinforcing the basic sciences in a competency-based curriculum.

Where the basic sciences are taught by other units, the national curriculum would provide potential savings to those units also. These savings could be realized by designating a single faculty position per discipline that would focus solely on teaching. The resultant staff savings could be reallocated or used to support the research mission of the institution.

A similar potential exists for behavioral and clinical sciences, though this would depend upon the clinical practice system utilized by the school and of course the size of the student body. Though the national curriculum would provide the best practices program, there would need to be continued reinforcement of the con-

tent in the patient care process. This would require a major commitment to faculty development in order to provide an appropriate cadre of qualified faculty.

As stated, the number and qualifications of clinical faculty members would depend on the clinic system. If the clinical practice program is department/specialty-driven, then only minor cost savings are likely to arise. If, however, the clinical program is driven by a generalist concept, i.e., the core program is the responsibility of a group of general dentists who guide and mentor students in all areas of dentistry, then the number of specialists could be reduced or their duties changed to focus more on graduate rather than undergraduate students, as well as on clinical research, which could enhance revenue.

Overall, the availability of an electronic national curriculum has the potential to affect much more than the margins of our budgets. Even a 10 percent decrease in the overall expenditure on salaries would save almost $1.0 million per dental school. Further changes in the clinical program discussed below could result in additional cost savings.

Costs Related to Students

Without doubt, a major problem related to the cost of academic dentistry is the tuition charged to complete the program. Student debt upon graduation is now staggering and very definitely affects career choice, as well as access to our programs. Not only is tuition burdensome but the cost of living and loss of income associated with a full-time, four-year program aggravate the situation. The cost particularly compromises access to underrepresented minorities who must rely almost entirely upon loans to complete their education.

As indicated above, an electronic national curriculum could significantly alter the nature of the first two years of dental school. The potential exists for the curriculum to be available "anytime/anywhere," and more importantly, the student would not be limited by a rigid daytime schedule of classes. Nor would the first part of the curriculum be limited to two years. Basically, students could negotiate the curriculum and maintain full-time employment simultaneously and live at home, thus reducing the net cost of at least this part of the curriculum. Tuition would likely not be changed a great deal, but we believe that an argument could be made to reduce tuition using an "anytime/anywhere" electronic curriculum during the first two years of the program.

Clearly, many variations to the "anytime/anywhere" theme described above may require students to be in the dental school—for example, one week per three-month quarter during their first two years for assessment and possible case-based discussion groups. The clinic simulation (preclinical laboratory experience) could be delivered in the summer between the second and third years along with clinic orientation.

The preceding narrative presents some alternatives to our traditional four-year curriculum. We realize that the very value of the school of dentistry to the university may be compromised by the proposed strategies, including the unique nature of each school's curriculum, the value of the role of freshmen and sophomore students in community programs, and the value of four years of intense contact in creating a professional. Some accreditation issues could arise, especially if the electronic curriculum is commercially developed. At least one additional risk could follow the development of the national curriculum: if the curriculum for the first two years were virtually identical in all schools and the students participated in an "anytime/anywhere" program, then it would be difficult to justify major tuition differences between institutions for this part of the program.

Strategy II: Changes in the Clinical Component of the Predoctoral Program

At the outset of this paper we promised to take risks, to push the envelope, think beyond the box, and be iconoclastic. To a bean counter, this is anathema. It is like moving debits to the other side of the ledger and leaving the books unbalanced. However, let us try to sneak up on a few ideas:

- *First,* eliminate patient care by students. From a fiscal viewpoint, if we are losing on each procedure, why continue this very inefficient mode of operation? With simulators currently available to dental education and the enormous strides we will make over the next few years, surely we can eliminate patients who seldom have the correct treatment needs, who always have excess needs when we try to deliver comprehensive care, and who usually do not arrive on time or pay for treatment when requested. While this eliminates clinic revenue entirely, surely without live patients we can save even more.
- *Second,* for the purists who feel that some care to patients is an educational necessity, a plan could be adopted similar to the "cooperative education" plan

described earlier. Under this approach, we would raise tuition levels by the amount of current clinic revenue. Students would pay the higher tuition, but in return they would keep the fees paid by their patients. This would be a true real world experience.

- *Third,* large multi-region training and testing centers could be developed where students would matriculate and undergo the first two, three or even four years of their education. Upon completion, the students would advance to an existing dental school where they would engage in patient care at the advanced general or specialty level. This possibility stems from the earlier discussion about a national curriculum, with extensive simulation experiences for students not required to be present at the dental school. This suggestion can keep all schools open and allow them to concentrate on training students at the graduate level. A tuition-sharing system from the centers would have to be developed.

Now to return from the fringes. It is possible to treat patients in a much more efficient manner. However, the faculty must be ultimately responsible for the care each patient receives. This is not the responsibility of the student or the staff. Hassler[17] recommended merging faculty and student practices so that faculty take the responsibility for providing some of the care as they teach and model behaviors. This can go even further and combine advanced education students with faculty and first professional students in patient care teams. This would most closely emulate the medical model, which has often been discussed. In any case, faculty must be providers and role models as well as mentors.

The key ingredient missing from existing dental clinic activities is productivity. Because clinical care is primarily an educational activity, it is felt that it must progress at its own pace with the argument for higher productivity and efficiency of care muted by the educational process. In many cases it is not in the best interest of anyone involved to improve productivity. The clinic system, which must coordinate scheduling of chairs, instruments, patients, students, charts, and faculty (of the appropriate specialty), is at best cumbersome if not counterproductive. Faculty and staff have no reason or interest in a more efficient clinical operation (usually translated into more patients per clinic period) because it simply means more work or a more inadequately performed educational experience.

The truly unfortunate part of the formula is that it is not even in the student's interest to attempt to practice productively. In light of the previously mentioned influences, to expect the student to try to see more patients and use time more productively is like expecting students in a master's or doctoral program to wish to write additional theses in order to more fully understand and appreciate their field of study.

Serious consideration should be given to Machen's[11] suggestion of partnering with organized dentistry. This initiative could entail moving portions of clinical education beyond the school to community-based practices and facilities. Although dental schools may be unable to charge enough and practice efficiently enough to cover variable costs, many community sites and all private practices have resolved this problem. If not, they would no longer be in existence.

These practices are not viewed as a site for an occasional student rotation but as integral and mainstream locations for both the education of dental students and the treatment of dental patient populations. By partnering with organized dentistry, we can greatly expand our off-site facilities, enhance faculty recruitment and retention (teaching faculty would remain in community locations), and bring a patient-centered focus to many needy populations. If these practices are successful, we may even be able to reduce reliance on student tuition and thereby hold the line on student debt. The practice management curriculum would have an appropriate locus for implementation of its program. This may also ease the burden on the neglected physical facility.

A variety of formats can be used by schools such as actually starting practices in locations with underserved populations, providing "associates" to existing practices that offer excellent educational opportunities, or purchasing practices from retiring dentists who may then remain with the practice in a teaching capacity. Several schools have tried such programs with varying degrees of success. We can learn from them. We must always keep in mind that this is a partnership with organized dentistry (i.e., the practicing community), for competition between these segments would greatly impair the profession.

It was stated earlier that the federal government has become a "virtual non-entity" in financing the dental educational enterprise. It must be brought back. If dentistry wishes to be an equal player in the academic health center and add to the reputation and prestige of the university, it must do so with research funds. In order to successfully compete for such funding, activities such as the dentist-scientist programs must be rekindled. It may be myopia, but the federal government is the most likely (only?) source for such funding.

Dental education graduate programs have recently been included with hospitals' Graduate Medical Education (GME) funding. Notable successes have been achieved at UCLA and Florida. As we all are more successful at being included with the hospital residency count and receiving these federal funds, the increase in debt levels for advanced training can be substantially mitigated and also achieve some operating support for the school. As the argument is raised for both forms of federal funding, it is crucial to remind everyone that these are the friendly folks who gave us "capitation" funding.

As we consider forays into federal funding, we must remember that "organized dental education" as embodied in the AADS has led the way in our early successes. It is this organization that we all must grow, strengthen, and foster.

Conclusion

Our review of previous studies led us to conclude that approaching our task within paradigms that allow only for marginal changes in dental education financing would be an exercise in micro-management and could be accomplished by simply rearranging what had already been written. We have attempted to present strategies that could potentially have a significant effect upon the cost of academic dentistry. We decided to go about our task by extending our thoughts beyond the somewhat compromising limitations of the traditional four-year curriculum. Specifically, these relate to the presentation of the curriculum, especially in the early part of the program, and to the clinical practice program.

The fundamental purpose of this summit is to discuss the value of the school of dentistry to the university and/or academic health center. We indicated in our narrative that from a financial point of view the value of the dental school might well be acceptable if, after certain criteria are met, the value could be measured in more than just financial terms. In fact, it may well be that the value of our schools arises from the stability of the traditional four-year program and the role of the clinical practice program in providing care to a diverse local population of patients. In addition, the value of the school may be related to having the dental student community present in the academic health center at all times during their four-year program where they are involved in multidisciplinary programs, community programs, and research. It could very well be that, within the parameters discussed, the value of the school of dentistry to our university is little related to finances.

The expanding sophistication and capabilities for curriculum development through information technology will challenge our thinking. We believe that the electronic national curriculum will be available well within the next decade and that we will need to recognize this in our planning. We also believe that access to care will continue to be an evolving issue and that our schools will be called upon to deliver care to certain populations who need our services but cannot access the dental school clinics.

We also believe that student indebtedness will continue to be a major concern for students and a limiting factor in accessing dental education to many well-qualified candidates. Amelioration of this debt occurs through choices that take advantage of payback schemes. Again, as is the case with other costs, manipulation at the margins, even the "billion dollar endowment" idea, will not resolve the debt problem. The strategy presented here, allowing students to matriculate and then continue their education "at home," has the potential for dramatically reducing graduating debt. There are risks, of course, and again we realize that, even though graduation debt is identified as a major concern by us all, in the face of the alternative it may be seen as reasonable/acceptable.

In developing this discussion paper, we decided to step away from the marginal approach that has driven similar financial reviews in the past and put our feet into the hot waters of major change. We agree with the statement that "no strategy should be adopted without careful analysis of its implications for the education, research and patient care missions of the dental school."[1] As with all discussion papers and attempts to take an iconoclastic approach in a reasonably traditional area, however, there are holes and probably contradictions, to say nothing of several conundrums. Yet we seek to understand the value of our schools to our parent institutions and conclude with a series of questions:

- Do the costs of dental academic programs have an impact upon their value?
- If the costs of dental academic programs continue to rise, will this compromise their value?
- Is the value of dental academic programs based upon their traditional program structure?
- What factors/issues would have the most impact upon increasing the value of dental academic programs to the institution?

- What factors/issues would have the most impact upon decreasing the value of dental academic programs to the institution?
- Can we develop a list of values? Can this list be prioritized?
- What strategies do you, as university administrators, recommend for implementation to enhance the value of dental academic programs to the university?

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