



Ross School of Business at the University of Michigan

Independent Study Project Report

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TITLE : Business plan : University of Michigan Hospital, skin bank

**BUSINESS PLAN:
UNIVERSITY OF MICHIGAN HOSPITAL, SKIN BANK**

By

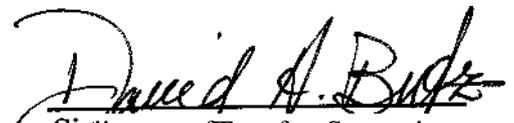
ARTURO O. ARAYA

**A research paper submitted in fulfillment of the requirements for 3.0 credits,
GRADUATE INDEPENDENT RESEARCH PROJECT SPRING TERM 1999
Professor David Butz, Faculty Advisor.**

Faculty Comments

Arturo's independent study extends work he began with me in the fall of 1998. He has worked closely with Dr. Paul Taheri, MD, MBA, who heads up the skin bank at the University of Michigan Hospital. The fall study reported initial efforts that Araya took to devise a new strategic plan for the unit. The basic problem was that the skin bank's mainstay product, human cadaver skin, was rapidly becoming obsolete, largely because new bio-engineered products were coming online that worked better.

This study documents a major effort to refine the strategic plan, and to implement it. The written paper is very high quality, but it isn't by itself the major accomplishment. Araya was one of two key players, along with Dr. Taheri, in saving the skin bank from an otherwise near-certain demise. What is not reflected in this paper is Araya's contribution in establishing a highly profitable and productive relationship between the University of Michigan Burn Center and medical products manufacturer Smith and Nephew. The Burn Center will help to distribute Smith and Nephew's product; it will educate Smith and Nephew's sales force; and it will hold seminars for physicians who use the Smith and Nephew product. In return, Smith and Nephew will contribute several hundred thousand dollars each year to the hospital, and it will sponsor research undertaken by the Center for Health Care Economics. Arturo's two independent studies were critical to the transformation of the skin bank from a highly vulnerable supplier of an outdated product into a center of profits and innovation within the hospital. The project has been held up by the hospital leadership as an example of how other units can adapt and prosper.


Signature of Faculty Supervisor

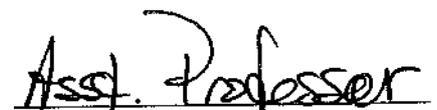

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Project Objectives:

The objectives of consulting for the University of Michigan Skin Bank (UMHSB) were the following:

- To provide a financial analysis for the UMHSB operation
- To compare UMHSB to industry norms and against burn care trends
- To evaluate the UMHSB value to hospital operations
- To suggest improvements should the UMHSB prove competitive within the industry
- To recommend a profitable and strategically sound alternative should the UMHSB prove non-viable.

Recommendations:

1) Establish a "Center of Excellence" for burn care called "The University of Michigan Burn Resource Center".

Establish a center of excellence to distribute a portfolio of leading edge bio-technical and burn care products as well as Homograft (human cadaver skin). To accomplish this Burn and Trauma Center physicians will need to be trained by suppliers in the use of their products and will then provide consultation to regional healthcare facilities that also treat burn victims. Training will allow physicians to offer burn care expertise on the use of the portfolio of products supplied by The Burn Resource Center. Additionally, the UMHSB should offer professional training for a fee, whether at the University of Michigan Hospital or off sight.

2) Require comprehensive funding from suppliers for new facilities, or changes to the existing facility, that are needed to convert the skin bank into The Burn Resource Center.

Suppliers should provide financial resources to support the training programs. In addition to the costs for facility upgrades, suppliers should cover the initial physician training expenses and the pro-rated share of physicians' salaries (for their time spent training others). Profit should be generated through a combination of sources including supplier subsidy, outside physician training fees and retail profit margins from product sales. Additional profit should be generated by the UMH by charging a fee for suppliers that wish to use The Burn Resource Center seal of approval in their marketing efforts.

3) Inaugurate TransCyte as the first Burn Resource Center product with comprehensive training and support.

Complement the product portfolio with Homograft procured externally from a low cost supplier. Use Smith and Nephew as a resource to develop the center. They have experience with Centers of Excellence in other product lines.

4) Phase out Homograft processing over a two-year period. Transition all customers to low cost, externally procured Homograft, which is distributed by the UMHSB.

Take advantage of high volume purchases to gain better pricing. Process in-house only the tissue for CoUagenesis with the intent to discontinue production at the end of the second year. Liquidate equipment that was used only to process tissue.

5) Develop a formal process for approving products that will be offered and supported by The Burn Resource Center.

A strict approval process is necessary to avoid favoritism and to build and maintain the credibility of The Burn Resource Center. If the approval process is not rigorous, the portfolio will eventually be filled with products from suppliers that are willing to subsidize The Burn Resource Center the most rather than by products that are truly advancements in burn care.

Findings:

Current skin bank operations encompass three activities:

1. Skin processing, banking and internal/external distribution
2. Microbiological testing to support the Burn and Trauma department
3. Keratinocyte cell generation to fabricate and store tissue cultured from a patient's own skin.

The 1998 revenues and costs for each function are stated below:

	Skin Banking	Microbiological	Keratinocyte
Revenue	\$505,938	\$193,465	\$0
Costs	313,342	34,645	75,000
Percent of Revenues	72.3%	27.7%	0%

Of current Homograft sales, approximately 38% of revenues depend on sales to one customer, CoUagenesis. This customer represents 82% of the total volume of external sales. Collagenesis requires a different, thicker type of skin tissue that is not used for surgical procedures. UMHSB is already a second source of supply and has been losing sales at a yearly rate of 8%.

UMHSB is not price competitive with other suppliers of cadaver skin. The tissue banking industry has undergone extensive consolidation. To remain competitive other suppliers have combined the harvesting of higher margin tissue (cartilage, corneas, etc.) with the harvesting of skin tissue to achieve economies of scope. The harvesting teams are composed of surgical technicians, rather than doctors, who harvest tissue in a morgue

rather than an expensive operating room. The scale of operations and advantages of economies of scope cannot be surpassed by UMHSB unless significant investment is made. Even with significant investment it is unlikely that UMHSB can be cost competitive because it carries some of the hospitals significant overhead costs. Organizations such as the American Red Cross have specialized in harvesting tissue and their operations do not have the cost burden of hospital expenditures.

Over the past three years the number of burn victims in the United States has declined. The severity of burns and the percent of body coverage however have increased dramatically. Resultantly, the treatment of burns is becoming more focused on the care of severe injuries for which grafting procedures are not viable because not enough healthy surface area remains for the graft to attach.

Several new synthetic products threaten to replace Homograft, but as of yet are not used by the majority of physicians. Synthetic products are promising for several reasons. Firstly, they are significantly less likely to be rejected by the patient's auto immune system. Adoption of the synthetic graft means that only one application of the product is necessary. Homograft usually requires multiple applications every 8-10 days to prevent infections. Secondly, synthetic products are consistent from batch to batch so the doctor knows what to expect for every procedure. Thirdly, use of synthetic skin rather than Homograft reduces the potential for disease transmission significantly. Fourth, synthetic products have substantially longer shelf lives, exceeding Homograft by two times. Finally, synthetic skin is transported and stored more easily than Homograft. Approval is eminent for TransCyte to be stored at regular freezer temperatures rather than sub-zero environments this approval will significantly reduce the UMH storage costs. Several synthetic tissue products have been clinically tested at the University of Michigan Hospital with varied success, but only a few have been isolated as highly viable - one of these is TransCyte.

The Burn and Trauma department of the University of Michigan Hospital enjoys an excellent reputation for setting the standard for burn and trauma care. The Burn and Trauma Center is unusual in the industry in that it earns a profit. Most other trauma departments are resource drains on hospitals and are therefore given little attention. As a result the care and reputation of these institutions suffer. The Burn and Trauma Center is a source of innovation in the care of patients and suppliers to this department view the relationship as highly valuable.

Strategic Impact of Recommendations:

The strategy of turning the skin bank into The Burn Resource Center has several positive repercussions, which include:

- . Establishing the hospital as a resource center increases the prestige of the physicians and the hospital. Increased departmental prestige and physician prestige will draw

additional top doctors. Top physicians will increase the quality of the education at the UMH. High quality education will draw top pupils and top interns will again increase the prestige of UMH as a teaching hospital. The Burn Resource Center will generate a network of improvements that will vastly improve the quality of care delivered and the quality of the personnel.

- Offering consultative training to other facilities for a fee generates a new source of revenue.
- The skin bank business is declining and The Burn Resource Center will turn the operations into a thriving and profitable activity.
- Establishing a center of excellence for burn care has never been done before. Consequently, the activity will firmly establish the burn care capabilities of the University of Michigan Hospital as the de facto standard.
- Training of physicians by the suppliers of burn care products will ensure that the staff will have the most current capabilities.
- Suppliers of innovative products will seek out the University of Michigan Hospital before most other facilities because of the potential for Burn Resource Center approval and the resulting product credibility.
- The reputation of the Burn and Trauma center makes The Burn Resource Center approach viable and also difficult to imitate because potential imitators need first to build credibility and then they can attempt to form a center of excellence.
- The Burn Resource Center's prestige will lead to higher sales volumes. These higher sales volumes will increase the UMH power to negotiate discounts with suppliers.

Potential problems:

- High sales volumes and multiple product lines will necessitate an accurate costing and billing system.
- As much as possible, the time dedicated to receiving and providing new product training must be evenly distributed among the entire cadre of physicians. Equitable distribution of responsibilities for this will reduce the possibility of certain individuals bearing most of the burden.
- Suppliers need to pay for the training of each UMH physician. They also need to fully subsidize their travel and lodging expenses when they training physicians at

other locations. Also, suppliers need to offer incentives to physicians so they will be motivated to teach others.

- Extended payment terms or consignment needs to be negotiated with the suppliers. The Burn Resource Center will carry significantly increased inventory in both quantity and variety of products. UMH should not be responsible for incurring the new inventory carrying costs.

Valuation of University of Michigan Hospital's Namebrand:

To begin the relationship with Smith & Nephew as outlined in the recommendations, it is first necessary to establish a value for the hospital's approval. There is an economic value to this approval. The reputation the institution carries will go a long way in creating market acceptance for new products. The University of Michigan Hospital is considered a thought leader in burn care. Physicians at other institutions look to thought leaders for new products. Once the thought leaders have accepted the products then others are much more likely to begin to use the product.

I struggled with several different methods of valuing the approval. The methods ranged from standard marketing type of valuations to traditional financial NPV models. In the end I settled on a hybrid solution. The method forces projects to carry the hospital costs that any project would carry. In essence Smith & Nephew needs to carry the opportunity costs of the hospital if they choose another project. To establish the value of the relationship in the first year I summed the costs of utilities, overhead space allocation, new equipment, staff, and other costs. The result of this analysis was that in the first year the up-front costs were \$340,000. Then there were variable costs of between \$30 - \$40 per package of TransCyte. Smith & Nephew would have to cover these costs for the project to be at least break even. Additionally, they would need to cover all the opportunity costs of the physicians while they attend training or while they give training to other physicians at other facilities. I suggested that the relationship should have three components: opportunity costs recovery (for the physicians as well as the hospital overhead), per unit variable cost recovery. Having this information formed the basis of negotiations.

Hospital Presentation:

I decided to make a presentation to all the decision makers in the hospital that would have input on the success of this project. I was able to secure the presence of the Burn and Trauma Chief, the Surgical Chief, the head of the Skin Bank, the Hospital CFO and the head RN. The presentation brought the group up to speed on the work done to date on the skin bank project. I presented information pertaining to the declining demand for homograft material as well as declining priced due to excess supply of the material. I demonstrated graphically how the already thin margins of skin banking would become

negative within three years. I also showed how staffing requirements for the skin bank were more than robust. In fact, staff was being underutilized.

I then presented the idea of making the skin bank a center of excellence for burn care. I showed how dramatic the revenue change would be if homograft use were to shift to TransCyte. I also showed how staff could be better utilized and the synergies the relationship could build. There was strong initial interest in the idea. Most of the concerns centered around the legality of the relationship. The biggest concern was whether it was legal and ethical for a supplier to pay for inclusion into the center of excellence and whether it was ethical for a hospital to receive a fee for approval. These concerns are more than fair and need to be addressed by the lawyers of each organization. The physicians were also interested in how I calculated numbers presented for the revenues. I was able to adequately explain this. The last question from the group dealt with the validity of the TransCyte usage projections. When I explained the gradual ramping shown in the projections they were put at ease.

Negotiations:

The negotiations took several steps. The first was initial communication with Smith & Nephew about the intent to establish the supply relationship. The response to this initial contact gave a good indication of the desire of Smith & Nephew to establish this arrangement. Smith & Nephew struggled with whom they would put in charge of the negotiations because they have no such agreements with any other burn center. They settled on having very high level people conduct the negotiations. The main points of interaction were from the hospital the Chief of Burn and Trauma and from Smith & Nephew the VP of US Sales.

The negotiations were amiable but first centered around monetary issues. This occurred I suspect because Smith & Nephew is accustomed to conducting negotiations at this level. It turns out that both parties were actually more interested in sharing knowledge than in the supplier/buyer relationship. The hospital wanted first access to the newest technology and priority treatment. Also, the hospital wanted research on related technologies to be funded by Smith & Nephew. Smith & Nephew was also largely interested in knowledge sharing. They wanted their sales people to receive training directly on how TransCyte works and to have direct access to the physicians. Therefore, the negotiations based on money were far apart from the goals.

Cementing the Relationship:

The negotiations resulted largely different than expected because the University of Michigan Hospital will not act as a distributor for TransCyte. Instead, the hospital will give special training to the sales people and the scientists on how the Smith & Nephew products are used. The hospital will receive a generous fee for this valuable training. Smith & Nephew was willing to pay such a high fee because the training will give their

sales people a competitive edge over the competitors. In fact, a company selling a closely related product Integra, is now racing to try and set up a similar agreement with the hospital. Smith & Nephew will also fund research on costs related to the clinical use of TransCyte. This research is very important to the hospital physicians because they are required to perform research. Smith & Nephew will also discount the product price to the hospital allowing the university to capture better margins than my model predicts. The last component of the negotiations was that the findings from the research could be used by Smith & Nephew for sales purposes but it had to be referenced to work done by the University of Michigan.

Conclusion and Comments:

TransCyte, a promising product that has been tested extensively at the University of Michigan Hospital, has impressed physicians. For TransCyte to be broadly accepted in burn care units it needs to build credibility. Being approved for use by The Burn Resource Center will take the product a long way towards broader clinical acceptance. Most new clinical products require this sort of credibility building to become clinically accepted by physicians. Smith and Nephew, the maker of TransCyte, is willing to bring their resources to bear in support of the development of the center of excellence because they realize the value of UMH's approval. Other suppliers also realize that the approval of the highly prestigious University of Michigan Burn and Trauma department has real monetary value. As the prestige of The Burn Resource Center increases so will the value of approval. It is reasonable then for suppliers to pay a fee to advertise that their product has been accepted for use at The Burn Resource Center at the University of Michigan Hospital. The higher the prestige the more value the approval creates.

Creating a center of excellence for burn care, as we have suggested, is an enormous opportunity not only to create new revenues but also to bolster prestige and institutionalize innovation. This endeavor is only possible because the Burn and Trauma department already is already highly reputable. Credibility and reputation are sources of significant competitive advantage and are extremely difficult to imitate.

Suppliers will be of great assistance in the creation of this center. Smith and Nephew, for example, has assisted other institutions to develop centers of excellence that distribute other product lines. Other suppliers have also had similar experiences. Partnering with these suppliers must be viewed as a long-term relationship. Suppliers will need to be trusted to bring their innovations to The Burn Resource Center first; therefore close relationships with them are essential.

Cost Study Analysis

Analysis of Transcyte Proposal

	1999	2000	Year 2001	2002	2003
Homograft Revenues					
Total sq. ft. sold internally	80	74	68	62	57
Total sq. ft. sold externally	23	21	19	18	16
Total sq. ft. sold to Collagenesis	103	94		0	0
Revenues from internal sales	\$102,771	\$94,550	\$86,986	\$80,027	\$73,625
Revenues from external sales	\$15,750	\$14,490	\$13,331	\$12,264	\$11,283
Revenues from sales to Collagenesis	\$71,750	\$66,010	\$0	\$0	\$0
Total revenues	\$190,271	\$175,050	\$100,316	\$92,291	\$84,908
Cost of goods sold (internal/external)	\$56,397	\$51,885	\$47,734	\$43,916	\$40,402
Cost of goods sold (to Collagenesis)	\$29,725	\$27,347	\$0	\$0	\$0
Gross profit	\$104,149	\$95,817	\$52,582	\$48,375	\$44,505
Gross profit margin	55%	55%	52%	52%	52%

Homograft Costs					
Facilities overhead	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Payroll (based on allocation of personnel)	\$20,500	\$18,860	\$3,505	\$3,225	\$2,967
Utilities (allocation based on % of total tissue sold)	\$9,751	\$7,591	\$3,446	\$2,717	\$2,185
Total controllable Homograft expenses	\$40,251	\$36,451	\$16,952	\$15,942	\$15,152
Other expenses (Depr., Insur., Disability, Retirement, Fica)	\$12,165	\$9,471	\$4,300	\$3,390	\$2,726
Shipping/containers	\$300	\$276	\$46	\$42	\$39
Dry ice (50 lbs per 5 cassettes @ \$17.50)	\$438	\$403	\$67	\$61	\$56
Operating Profit (before taxes)	\$50,995	\$49,216	\$31,218	\$28,941	\$26,533
Operating Profit Margin	27%	28%	31%	31%	31%

Transcyte Revenues					
Total cassettes sold internally	310	400	400	400	400
Total cassettes sold externally	0	20	130	240	350
Revenues from direct internal sales	\$697,500	\$900,000	\$900,000	\$900,000	\$900,000
Revenues from direct external sales	\$0	\$27,000	\$175,500	\$324,000	\$472,500
Rebate revenues	\$39,250	\$58,500	\$77,750	\$97,000	\$116,250
Total revenues	\$736,750	\$985,500	\$1,153,250	\$1,321,000	\$1,488,750
Cost of goods sold	\$395,250	\$535,500	\$675,750	\$816,000	\$956,250
Gross profit	\$341,500	\$450,000	\$477,500	\$505,000	\$532,500
Gross profit margin	46%	46%	41%	38%	36%

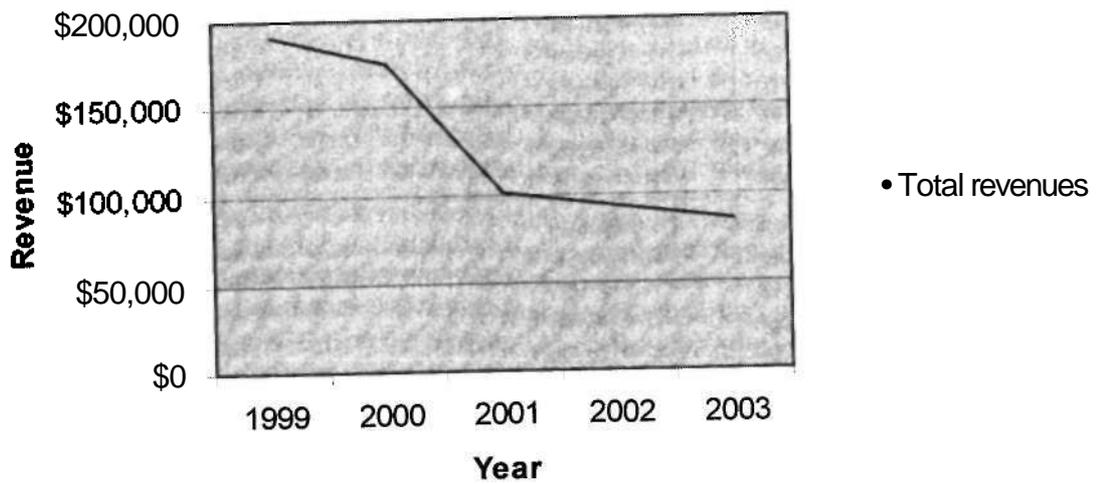
Transcyte Costs					
Facilities overhead	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Payroll (based on allocation of personnel)	\$32,469	\$43,990	\$55,511	\$67,032	\$78,553
Utilities (allocation based on % of total tissue sold)	\$14,742	\$16,902	\$21,047	\$21,776	\$22,308
Total controllable Transcyte expenses	\$57,211	\$70,892	\$86,557	\$98,808	\$110,861
Other expenses (Depr., Insur., Disability, Retirement, Fica)	\$18,393	\$21,087	\$26,258	\$27,168	\$27,832
Shipping/containers	\$0	\$100	\$650	\$1,200	\$1,750
Dry ice (50 lbs per 5 cassettes @ \$17.50)	\$0	\$70	\$455	\$840	\$1,225
Operating Profit (before taxes)	\$265,896	\$357,851	\$363,579	\$376,983	\$390,832
Operating Profit Margin	36%	36%	32%	29%	26%

Total revenues (all tissues)	\$927,021	\$1,160,550	\$1,253,566	\$1,413,291	\$1,573,658
Total cost of goods sold	\$481,372	\$614,732	\$723,484	\$859,916	\$996,652
Total gross profit	\$445,649	\$545,817	\$530,082	\$553,375	\$577,005
Total Net Profit	\$316,892	\$407,068	\$394,798	\$405,924	\$417,364

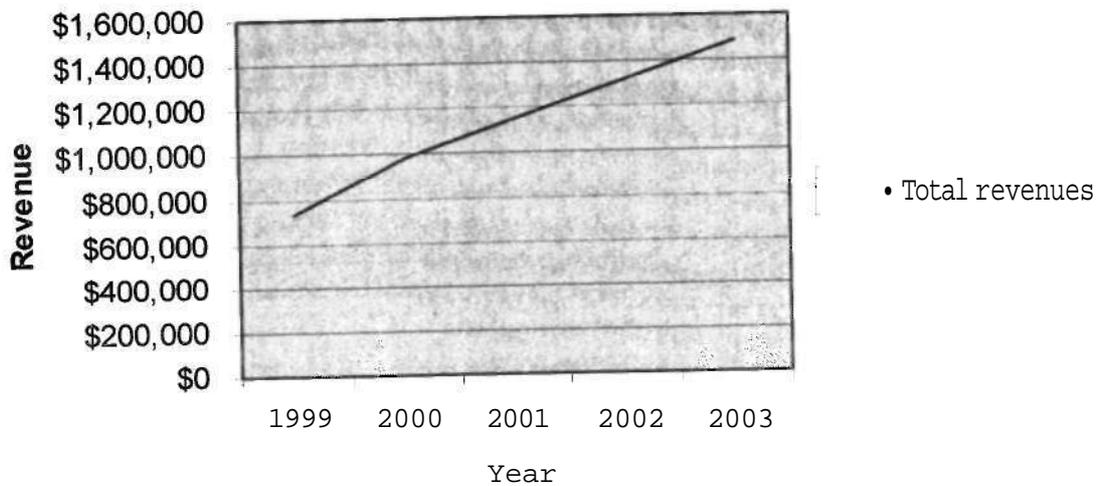
Graphical Summaries

Revenue Projections

Homograft Five Year Revenue Projections

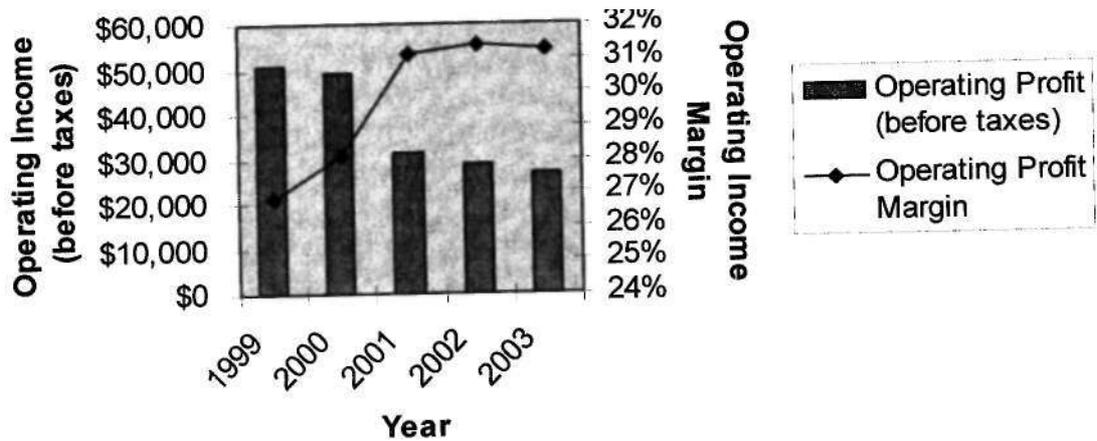


Transcyte Five Year Revenue Projections

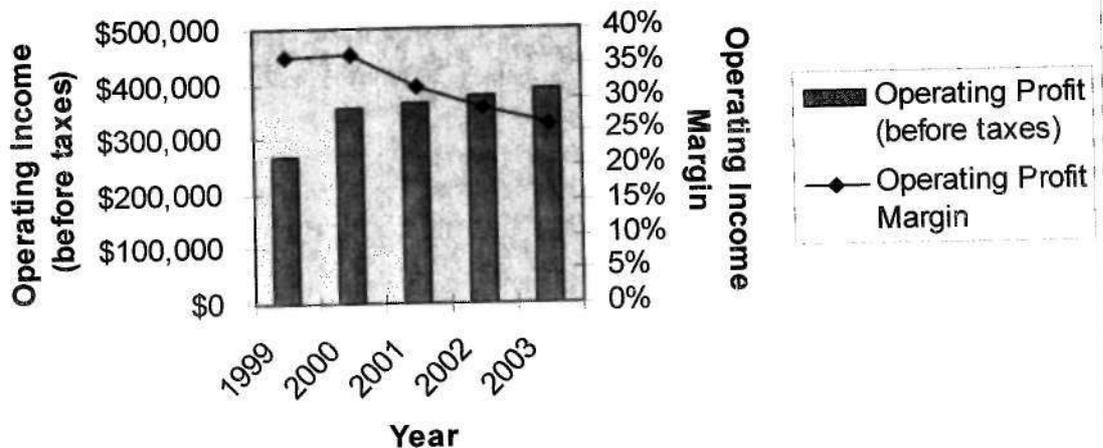


Income vs. Margin Projections

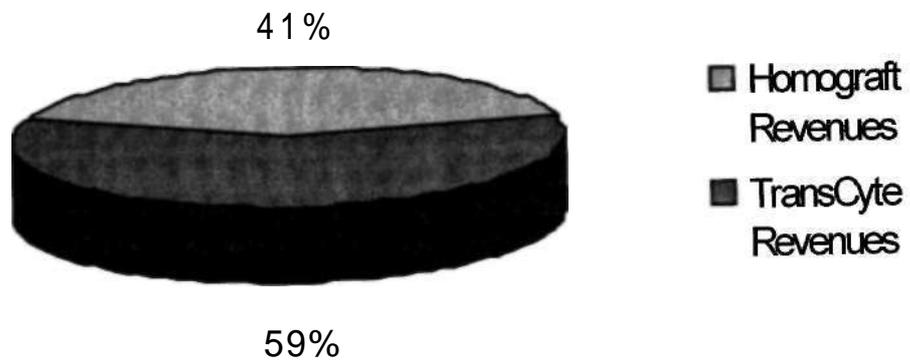
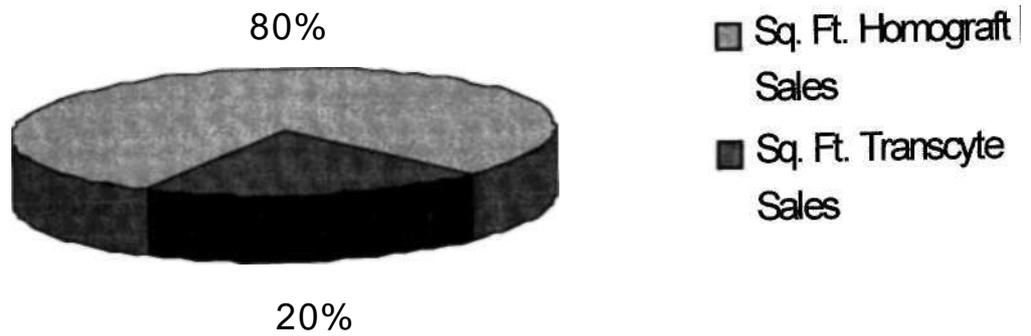
Homograft Operating Income and Margin Five Year Projections



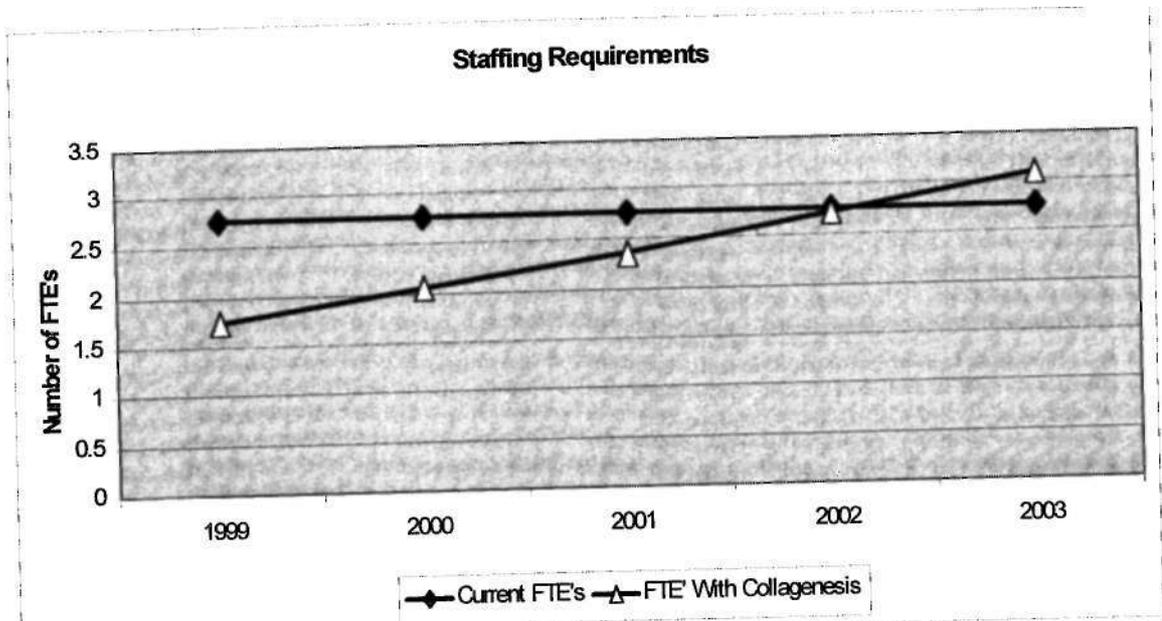
Transcyte Operating Income and Margin Five Year Projections



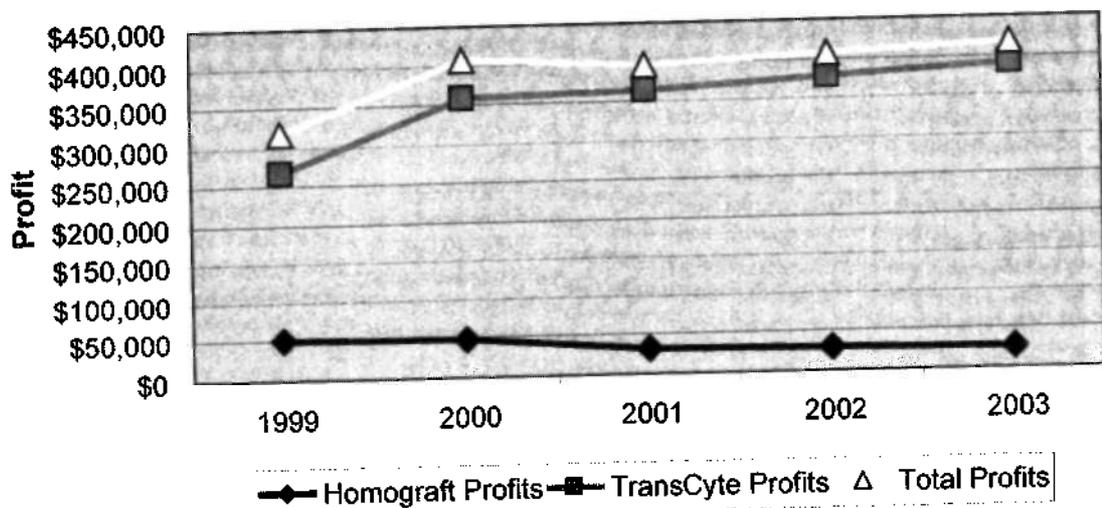
Revenues From Current Activities



Other Graphs



Profit Projections for S&N Proposal



Analysis of Transcyte Proposal Assumptions

1. 1999 external Homograft sales projections are based on actual sales volume achieved in the first five months of fiscal year 1999 annualized for 12 months.
2. Actual sales volumes in the first five months of fiscal year 1999 show that sales to Collagenesis comprise 82% of all external Homograft sales. Our projections are based on this percentage.
3. Calculations do not reflect inflation or expense increases over time.
4. Smith & Nephew will sell Transcyte to the University of Michigan Hospital (UMH) on consignment. Therefore, UMH will not have to finance any Transcyte related inventory carrying costs other than utilities and facilities overhead.
5. Inventory finance costs will be incurred for Homograft unless consignment is negotiated with the supplier. Financing cost of capital is not included in our projections.
6. Revenues from distributing Transcyte will come from the discount off list price and cassette rebates only. Smith & Nephew will not pay any fee to UMH for endorsement of Transcyte.
7. UMH doctors' fees for conducting training and assisting in procedures involving Transcyte at other hospitals are not included in our projections. Additionally, related incidental fees such as transportation, accommodation, and meals are also not included.
8. Current man-hours consumed by Homograft related activities are 75% of total man-hours used for both Homograft and Transcyte.
9. Of the time expended on Homograft related activities, 40% is consumed by sales to Collagenesis, and 60% is consumed by internal and other external sales.
10. Current man-hours consumed by Transcyte related activities are 25% of total man-hours used for both Homograft and Transcyte.
11. Time and personnel required when outsourcing Homograft tissue is one-fourth of that required when producing it in-house.
12. The current skin bank facility is approximately 1,200 square feet. Homograft and TransCyte related activities will occupy one-third, or 400 square feet of the facility each.

Analysis of Transcyte Proposal Assumptions

- 13 Space required for Homograft, Transcyte and microbiological activities each comprise one-third of the currently available space. This ratio will remain constant even though a product's percentage of total unit sales and volume sold will change.
14. Facilities overhead is \$25 per square foot.
- 15 Homograft sales will decline 8% per annum due to reduction in burn victims and transfer to Transcyte. This estimate is based on historical trends.
- 16 External sales of Homograft will initially increase due to a price reduction and broader customer base as a result of a wider product offering. Sales will decrease, however, at a rate of 8% per annum after the first year.
17. Sales to Collagenesis will continue for two more years and will match the total square footage of other external Homograft sales.
- 18 Combined internal and external Transcyte sales will increase from 200 cassettes in ' 1998 to 750 cassettes in 2003. Within the five-year projection time frame no sales will be made to the Detroit Hospital.
19. Internal sales of Transcyte will plateau at 400 cassettes by the year 2000.
20. Smith & Nephew will pay for any necessary infrastructure modifications to the existing facility.
21. Transcyte shipping costs, excluding containers, will be paid for by Smith & Nephew.
- 22 Allocation of costs is based on the percentage of units sold of either product ' (Homograft or Transcyte) to the total units of tissue (Homograft and Transcyte) sold.
23. Units of Homograft are measured in square feet, whereas units of Transcyte are measured in cassettes.