
Disruptive Innovations, Quality of Life, and Social Marketing in Biotechnology: Application of Patient Quality of Life Surveys in Refractive Surgery

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Abstract:

The health care industry is replete with powerful industry forces that resist simpler alternatives to expensive treatment modalities because those innovations threaten their revenue streams. Termed “disruptive innovations”, many of these new technologies may threaten entrenched interests at the same time they benefit doctors, hospitals and patients and provide the opportunity to inject market forces into a highly regulated market. This study, focused on the laser vision correction market within the ophthalmology industry, uses a newly validated National Eye Institute Quality of Life instrument to adopt a patient-focus when evaluating new treatments for complex vision disorders. Conclusions indicate that many incumbents either over-shoot or under-shoot the needs of patients, creating expensive, deeply dissatisfying care. New innovations, however, offer higher quality and better outcomes for patients undergoing eye surgery.

Introduction:

Governments throughout the world are facing awesome problems with their health systems. Health care is expensive, the costs are rising and the effect of inadequate health care is devastating on the individual. The aging of the population and the high cost of complex technology have placed immense pressure on hospitals and health care agencies as the community demands increase and no compromise on health care is acceptable. Many hospitals and other health care providers are facing insolvency and the governments have little option but to increase taxes as the user pays principle is very difficult to justify particularly given the catastrophic effect of such a policy on the poor. Another option that is available and has the potential to ease the pressure is the development of “disruptive innovations,” namely “cheaper, simpler, more convenient products or services that start by meeting the needs of less-demanding customers” (Christenson, Bohmer and Kenagy 2000, p. 104). To fully utilise this option it is necessary to combat the power of the “entrenched powers” and let market forces operate.

An important part of making disruptive innovation work for consumers involves new products in health care in general, and in particular in the area of ophthalmology, where new diagnostic and therapeutic tools permit treatment of common eye disorders such as myopia, irregular astigmatism and corneal disorders, often using new products such as laser surgery or intra-ocular devices implanted into the eyes. New developments in the field of ophthalmology

have replaced products such as spectacles and contact lenses, and these disruptive, discontinuous innovations made products more accessible, affordable and widely diffused.

New product development in ophthalmology also permitted the extraordinary growth of the market segment for Laser Vision Correction, or LVC, throughout the world. A typical refractive surgical procedure to correct “myopia”, or standard near-sightedness, is an elective procedure, paid for by the consumer rather than reimbursed by insurance companies. Recent advances in the field have also permitted doctors to treat myopia with better accuracy and reliability, and furthermore, begin to tackle difficult vision disorders such as irregular astigmatism. Such advances also have application in repair of patient problems, where earlier refractive surgery has delivered less than desirable outcomes. The technologies driving these advances have been termed “disruptive innovations” by health care technology experts (Christensen 1997; Christensen, Bohmer and Kenagy 2000; Christensen, Johnson and Rigby 2002; Christensen, Suarez and Utterback 1998; Christensen and Overdorf 2000).

The LVC Market in 2003:

Incumbents, the producers of “sustaining innovations” or more sophisticated products aimed at the high-end of the market, (e.g. VISX, Bausch and Lomb, and Alcon), tend to introduce less radical products (Anderson, Macdonald and Ardrey 2003). Hence, patients are denied access to new treatment modalities. A justification of selecting the LVC market for investigation is the richness of competition in the market: both innovators and incumbents compete equally. This combination tended to push such innovations on the market to encourage the ever increasing numbers of patients, with a growing range of vision disorders, to undertake LVC surgery. Incumbents have consequently spent heavily on business-to-business marketing and business-to-consumer advertising and promotion of “custom surgery.” However, at the same time qualitative and patient outcomes have not necessarily improved. Thus the entrenched industry with its awesome financial power has resisted the entry of low end “disruptive innovations” in an effort to protect their market position.

The technology diffusing into the most rapidly growing segment of ophthalmology involves using medical lasers to sculpt or reshape the cornea to improve vision. Refractive surgery uses a laser beam, in the wavelength range of 193-213 nanometers, to “ablate”, or re-shape the patient’s cornea to improve clarity of vision. This form of LVC can correct myopia, hyperopia and – with the new and advanced technologies—reverse irregular astigmatism as well as repair the adverse effects of previous surgery. According to Macrae et al (2002), the goal of custom surgery is optimization of the patient’s optical system using treatments to reshape the cornea and correct the individual eye optics based on the unique needs and preferences of the patient. Human vision, consisting of optics and neural processing, is a complex system: LVC repairs the optics through simple, elective surgical procedures taking a few minutes for the surgeon to reshape the cornea using a medical laser.

The purpose of this study is to take a patient-focused approach to the LVC market, introducing a quality of life component to assess the real needs of patients considering refractive surgery. Participants in this study will be screened as surgical candidates using a subjective questionnaire. The instrument will again be given once the participant’s vision stabilizes, typically six months post-operatively when improved vision, or “refractive stability” is achieved. Business press and scientific literature suggest that new developments such as custom surgery, super fast scanning, solid state laser technology, and surgical planning software upgrades are beneficial innovations which have been resisted by incumbents specifically in the LVC industry (Regalado 2002; Van Saarloo, Anderson, Ardrey and Sanders 2002). As is the case in the medical industry in general, drug companies and medical advertising agencies have been spending billions of dollars on marketing and

product push initiatives. Significantly less, however, has been directed towards investigating whether new modalities actually improve patient quality of life (Petersen 2003).

Literature Review:

The macromarketing discipline examines the effects of marketing on society as a whole. This includes the impact of marketing exchanges on a range of consumer, government, industry and environmental stakeholders. Since pioneering research by Bloom and Novelli (1981), Dixon (1992), Kotler (2000), Robin and Reidenbach (1987), marketers have tried to overcome the problems of adapting commercial marketing strategies—appropriate for selling soda and chewing gum—to the design of programs seeking to increase the acceptability of a new idea, or practice, to a target group. Marketing undertaken in an ethical and socially responsible way is both more challenging, and more expensive than standard advertising and selling. Bloom and Novelli (1987) assert that it is easier to sell cigarettes to consumers, than more socially desirable marketing programs aimed at smoking cessation.

The marketing of technology, in particular biotechnology, is complicated by ethical and regulatory demands to quantitatively improve patient outcomes. The huge dollar amounts at stake for incumbents have attracted a range of questionable ethical marketing practices. These range from direct marketing to consumers (e.g. Viagra, Prozac, and Ritalin) to the employment of marketing companies rather than scientists to run clinical trials (Peterson 2003). Worldwide, over 300,000 refractive procedures were performed in 2002 (Executive Laser Briefings 2003). To quantify the marketing scale of the health care industry, Figure 1, below, demonstrates the increased direct and behind-the-scenes marketing expenditure by pharmaceutical companies, while Table 1 shows the high dollars at stake in the LVC industry.

Figure 1
Behind-the-Scenes Marketing Expenditure

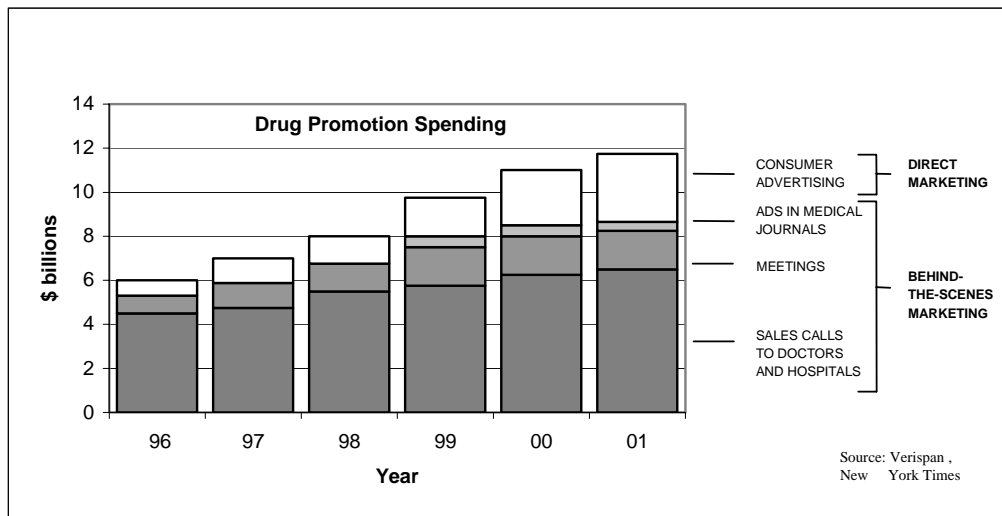


Table 1.0
Sales of Selected Medical Laser Manufacturers (\$ millions)

1999 2000 2001 2002E 2003F

Participants

Alcon (Summit/ Autonomous)	64	109	88	65	75
Bausch & Lomb Surgical	123	167	138	127	140
Carl Zeiss Meditec	36	42	39	38	44
LaserSight	22	35	14	10	12
Lumenis	142	162	315	365	420
Visx	271	200	170	140	161
WaveLight	6	18	29	35	42
Total	664	733	793	780	894
Year over Year Increase %		10%	8%	-2%	15%

Source: Spectrum Consulting, November 2002

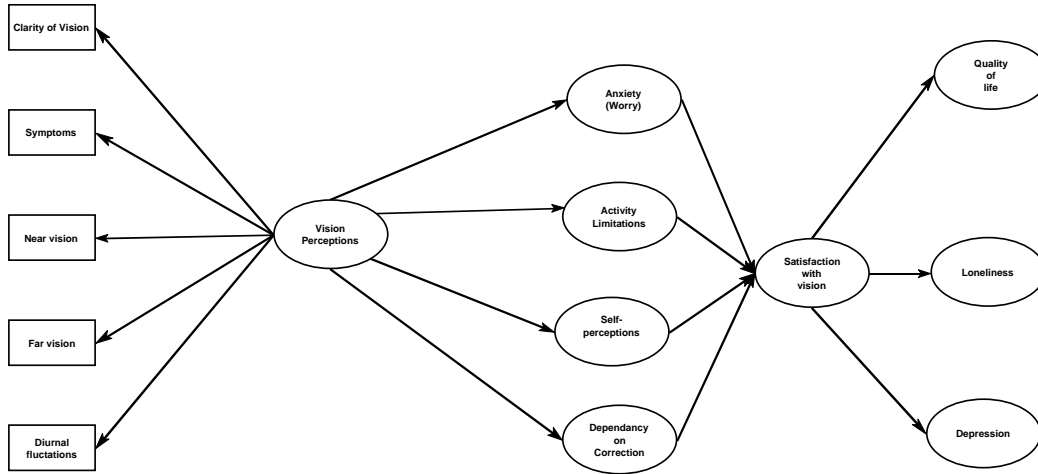
Notes:

- Summit bought by Alcon in 2000. Alcon's revenues for refractive only.
- Autonomous Technologies was acquired by Summit Technology in April 1999.
- Wavelight report on a different fiscal year than the calendar year shown.
- Meditec and WaveLight revenues estimated from Euros at current conv. Rate.
- Carl Zeiss merged with Asclepion-Meditec in 2002

For the LVC industry, new and disruptive innovations in the areas of laser beam generation (using new solid state technology to generate reliable surgical beams, rather than previous "excimer" technology which entailed the running of energy through toxic and caustic gas). "Wavefront" and "topography" guided surgical procedure (which integrate additional patient data from a variety of diagnostic tools to improve the accuracy of surgery) and superspeed eye tracking to permit lasers to "lock on" the eye for a duration of two minutes during the surgical procedure (using technologies developed in laboratories of universities, commercial labs and even the NASA space agency). Christensen and others (1997; 1998; 2000; 2002) have discussed the impact of new technologies in health care. Both Christensen (2002), Chandy and Tellis (2000) have documented incumbent resistance to discontinuous and entrepreneurial innovations.

Our preliminary and very rudimentary model on the basis of which the effectiveness of a vision and its change can be evaluated is shown as Figure 2. In the figure it is suggested that vision perceptions will contribute to anxiety, activity limitations, self perceptions and dependency on correction. These factors will determine the satisfaction with vision that in turn will impact on quality of life. Assessment of quality of life will include dimensions such as loneliness and depression, and it is expected that newer and disruptive innovations will have a more beneficial impact on patient quality of life. Use of market research methods in medicine will be undertaken according to the tenets of Zikmund (1998).

Figure 2
Vision and Quality of Life



Methods

A vision quality of life instrument will be administered to candidates for refractive surgery in Australia and Singapore organized via the Laser Sight Surgery Centers, a leading refractive surgery company operating clinics throughout the Asia Pacific. The instrument was developed by the National Eye Institute in the United States, and properly validated (Hays and Spritzer 2002). Importantly it is approved by both the American National Standards Institute and the US Food and Drug Administration. It contains 42 questions for prospective patients around their subjective evaluation of the vision quality, and ability to perform tasks requiring visual acuity (Macrae, Krueger and Applegate 2002). The study will also use quality of life and other instruments developed in marketing and other social sciences (Dembowski and Hanmen-Lloyd 1994).

Conclusion

With the results from this study ophthalmologists, hospitals and surgery centers can combine this data with quantitative assessments such as best corrected vision. Also, qualitative data can be used to screen patients for surgery, to discriminate between the need for treatment by standard technologies, or new disruptive solutions. Also, post-operatively, this instrument can be employed to evaluate patient outcomes. Applied implications are clearly better patient outcomes.

Public policy implications also impact the development of social marketing theory. Recent scandals in Australia and Singapore over drugs, vitamins, and herbal remedies have indicated that consumers have a propensity to over-use elective medications, medical procedures, and lack education about the safety and efficacy of their choices as well as impacts on quality of life. Survey research data will be discussed in terms of both applied and theoretical implications.

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