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Quality Enhanced Life Days ~ A New Metric for Hospital Sustainability

People do not live their lives to maximize the length. They live to enjoy quality time even at the expense of longevity. Individuals who donate kidneys or fall on grenades to save comrades are proud and extreme examples of decisions to choose quality over quantity. Every day we make many quality choices. In fact every minute we spend in an automobile statistically reduces our life by a minute. So if we drive 2 hours for some form of entertainment, we are indicating that we would be willing to sacrifice 2 hours of life for that enhancement.

Sustainability therefore should be about assuring future opportunities for life quality as well as quantity. Success is best measured by a new metric called Quality Enhanced Life Days (QELD).

Quality Enhanced Life Days

Quality Adjusted Life Years (QALY) is used widely in healthcare and is typically defined as perfect health years. McIlvaine has supplemented this term with a new term which reflects life enhancement beyond perfect health. A jail inmate may be in perfect physical health and generate one QALY each year. However, the average individual is enjoying life to an extent greater than the jail inmate. This enhancement factor is a key element in decision making.

The average U.S. 35 year old can expect to live 42 additional years while maintaining an average lifestyle. However, with maximum risk avoidance he could be expected to add another 15 years. He would gain these additional years by never traveling or mingling with other people. He would maintain a rigid diet and otherwise follow a course of action to maximize life.

Few would choose to add 15 years in exchange for this monastic lifestyle. The result is that individuals are constantly choosing to take risks that statistically reduce their life in terms of quantity for a perceived increase in quality. These life enhancements are described as Quality Enhanced Life Days (QELD).   All sustainability options can be rated in terms of number of QELD gained or lost.

One QELD,life enhancement perceived by an individual equal to one day of normal non-enhanced life.If someone would give up two days of normal life for one day of vacation at Disney Land, then each day of his Disney vacation generates one QELD. Most people are functioning based on assumed values of QELD of 1.18. They choose to live in a life style which will shorten their life to 80 years rather than the monastic style to live to 95.

The goal of the individual is to maximize composite years, as shown in the following graph of Composite Years for Three Life Styles.
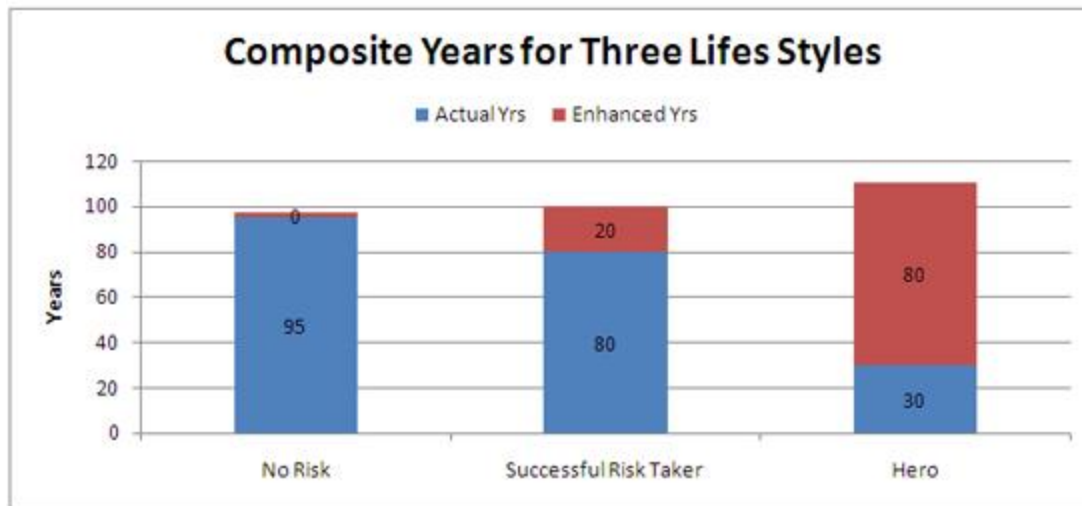
In the above example, the successful risk taker does better than one who takes no risk.Even though he only lives 80 years he has added 20 years life enhancement. So he has a combination of actual and QELD of 36500 days(100 years). The hero might be a 911 fireman or a medal-of -honor winner.He has added great quality enhancement to his life. Since this was voluntary and society showed its approval with honor and respect his total is higher than the other categories.

Many life enhancement choices do not involve corresponding actual life reduction. But for those choices which do provide an invaluable template for the individual and for society, to create a common metric to measure any initiative makes sense. If the individual establishes that a day at Disney Land is worth 1 QELD then he can evaluate other initiatives in comparison to the Disney Land Trip. If he decides on a new living room rug instead of a 5 day trip to Disney Land then he is placing a value on the rug that is more than 5 QELD. He may decide to take a computer training course with the money instead of the trip. He may decide on a fitness program as another alternative. He may alternatively decide to donate the money to a political campaign or to an environmental advocacy group. So now he is evaluating pleasure, health, government and education using the same measurement tool.

QELD is not a new concept. It is only providing a name and some logic to what every individual already does intuitively. The value of any decision is based on the QELD gained vs. the cost and risk (statistical actual life days lost).

Cost provides an alternate QELD option. One dollar has a different QELD value depending on the circumstances. Both a rich person and a poor person can experience the same QELD with a trip to Disney. But the cost of the trip in dollars is far less important to the rich person than the poor one. The rich person can buy the new rug and take the trip to Disney. So the QELD value of an alternative may be lower. The individual is continually comparing QELD options for the funds available.

QELD becomes a much better way to evaluate sustainability than alternatives because it reflects the aggregate desires of the populace. In a democratic society this is and should be the determining factor for policy (with the exception of minority rights protected by the Constitution). Policy on species extinction provides a good example of where QELD

should be used. Some mosquito species and polar bears are at risk of extinction. How much value should be placed on the survival of any particular species?Many people would we willing to sacrifice a day or two of an 85 year life or shorten a trip to Disney Land to sustain the polar bear. Most would not sacrifice at all to save a specific mosquito species. This aggregate QELD should be the guide for government in sustainability decision making.

QELD as Applied to Healthcare

There are many uses for QELD in determining which healthcare option is most sustainable. One use has been to compare the hospital choice of washing reusable surgical gowns as opposed to disposing of single use gowns. The manufacture of a single use gown results in an additional CO2 burden to the atmosphere. Since many single use gowns must be manufactured for each reusable gown, the CO2 or greenhouse gas burden is higher if the hospital chooses the single use option. Or is it?

Washing reusable gowns requires water, as well as energy for heating and drying garments. It results in water pollution as the wash water is discharged, and air pollution in the process of heating the water and subsequently drying the garments. So a comparison has to be made between the harm from one ton of CO2 vs. one ton of total suspended solids. Also the single use gowns will create more of a disposal problem. But the washing of the gowns results in other pollutants and the consumption of water. If the hospital is located in an arid climate the water consumption will be more of an issue.

Prior to the development of QELD Mcilvaine developed a common metric based on "equivalent" CO2. All pollutants are measured in tons of CO2 equivalent. This metric along with QELD was used to compare the single use vs. reusable gowns.An   87   page   detailed   analysis   of   this   comparison   is   available   at http://www.mcilvainecompany.com/SURS/subscriber/Default.htm
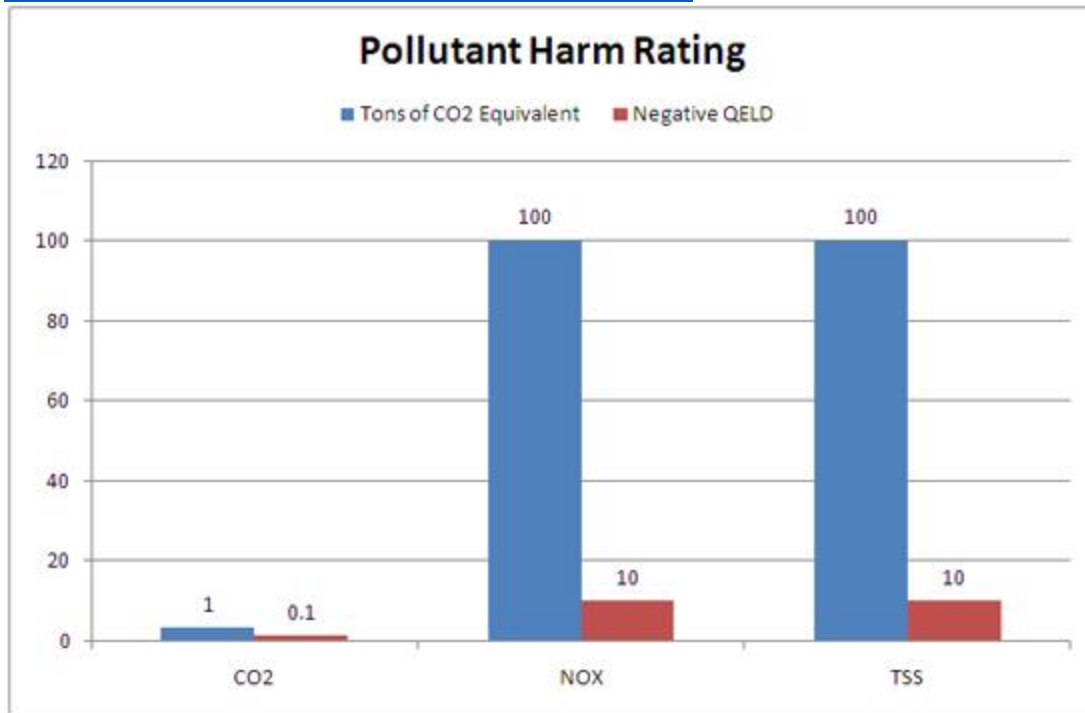
A comparison in tons of CO2 equivalent and QELD was made based on the assumption that the reusable gowns would last for 50 wearings versus only one for single use gowns. The negative QELD and CO2 tons equivalent were therefore based on 50 single use garments and 50 laundering cycles for reusable gowns.

Segment	Pollutant	Reusable Burden (tons of CO2 equivalent/QELD)	Single Use Burden (tons of CO2 Equivalent/QELD)

Garment manufacture	CO2	5.3/0.53	59/5.9
Garment manufacture	NOx	0.37/ 0.037	3.5/0.35
Laundry	CO2	48.6/4.86	0
Laundry	NOx	3.0/0.3	0
Laundry	TSS/CBOD	15/1.5	0
total		72.27/7.2	62.6/6.2

An analysis of major air and water pollutants shows a negative 7.2 QELD for the wearing of 50 reusable garments versus 6.2 for the single use garments. So with this analysis the choice is single use garments.

But there are other considerations. One is safety. Reusable garments introduce the uncertainty of protection with many uses. If one death were to be caused in just one out 500 million wearings it would add 7.0 negative QELD to the 50 wearing analysis. So safety QELD implications are huge compared to other considerations.

There is also the landfill depletion consideration with single use garments. But the fuel value of these garments is attractive. They would displace coal and other fuels in waste to energy plants thereby eliminating the land fill depletion factor. In arid areas the use of water for reusables would add a negative 7 QELD. On the other hand, the consumption of petroleum (depletion thereof) with single use garments would add a negative 1 QELD. Other factors considered in the analysis were linting, comfort, and flammability.

The conclusion is that single use garments are better from the sustainability perspective in all cases. Without safety considerations there is only a slight difference. With even a small difference in safety there is a very big difference in QELD. In arid areas the single use garments would create only half the negative QELD of reusable garments.

The basis for the CO2 equivalent estimates are a wealth of data available from EPA.EPA estimates that a life is worth $7 million. Many initiatives to reduce greenhouse gases are based on the trading value of $20/ton. This means a life is worth 350,000 tons of CO2. The benefits from eliminating a ton of total suspended solids from water are estimated by EPA to be 100 times greater than the $20/ton for CO2 based on the cost justification analyses that EPA utilizes in justifying water pollution rules.

So CO2 can be used as a common metric as long as one agrees with the EPA assumptions. The problem is that many people place a value on CO2 which is either above or below $20/ton. But based on the $20 value for CO2 a ton of CO2= 0.1 QELD. So now all comparisons can be made based on QELD. This becomes a metric which is not fluctuating with CO2 values determined by the government. QELD would reflect the aggregate value for CO2 as determined by all the individuals in the populace.

The QELD value of a pollutant such as CO2 is subject to constant change based on public perception and recent experience. The recent recession and controversy over the accuracy of some of the global warming claims tend to lower the value of reducing this pollutant. On the other hand new findings may raise concerns.

Individual Hospital Decisions

The decision on placing QELD value on pollutants is further complicated by the circumstances of an individual hospital. A hospital in an arid region will want to assign a greater QELD to water resources than one in a water rich region. A hospital in an urban area would assign a greater value to landfill space than one on a rural setting.

One of the thorniest decisions is classified as the "Tribal Value". Does the hospital owe its allegiance to the community it serves, to the province or State, to the Federation or Nation or to the world. A hospital in Ontario Canada had initially decided to switch to reusable gowns because of the CO2 potential created by single use gowns.

Further investigation revealed that the water pollution impacts of switching to reusable gowns would impact the local community. The positive impact of the switch in terms of CO2 reduction would mostly benefit people living along the

earth's equator. Global warming might have favorable impacts on the crop growth and life quality in the province. So the hospital was faced with the decision of whether to make the decision which is best for the community or best for the world. This is the "tribal value" factor and is one which needs to be addressed in hospital decision making.

Another relevant concept is discounted future value. If the Canadian hospital switches now to reusable garments there is an immediate negative impact on community water quality. The positive impact on equatorial nations is much longer term. How much less valuable is life quality enhancement 50 years from now compared to comparable life quality enhancement today?

The common metric using Quality Enhanced Life Days (QELD) promises to be an important new tool for evaluating the full gamut of health care sustainability decisions. With the additional tribal value and discounted future value embodiments it would address the full range of political, moral, social, and economic factors which should be considered in any sustainability decision.

About the Authors

Founded in 1974, the Mcilvaine Company provides consulting and other services relating to air, water, and energy. It developed a harm rating system for all pollutants in 1990. In 2008 Mcilvaine was contracted to provide analyses to the healthcare industry using its rating expertise. A result of this work was a new metric to measure sustainability. Mcilvaine clients include large companies in healthcare as well as governments and associations. It serves a wide range of industrial companies including many of the world's largest . Mcilvaine offices are located in Northfield Illinois (www.mcilvainecompany.com)Robert McIlvaine is President of McIlvaine Company and Tom Tschanz is Senior Consultant, McIlvaine Company. rmcilvaine@mcilvainecompany.com / 847-784-0012