



ASPO-Australia

Australian Association for
the Study of Peak Oil & Gas
Health Sector Working Group

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Supplementary Submission to the Senate Inquiry into Australia's Future Oil Supply

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Introduction

Australia’s healthcare system is critically dependent on oil and its products. Almost every aspect of healthcare delivery here uses oil in one form or another. The dependence is so extreme that our system will probably cease to function effectively once peak oil occurs and petroleum products become scarcer and more expensive.

The previous ASPO-Australia Healthcare System Submission, written by two non-medical authors, focussed primarily on the transport aspects of the healthcare system. This supplement, in contrast, has been prepared by two practising doctors – one a specialist anaesthetist and the other a general practitioner. While transportation remains a major issue in healthcare provision in terms of scope and impact, there are several other areas of oil use that are less visible but of similar, if not greater importance: all are currently essential for successful health care provision.

The consequences of peak oil on medicine will be progressive, from a base of business as usual there will be a gradual rise in the frequency and severity of problems stemming from increases in price and decreases in availability of fuel. The purpose of identifying the areas of critical fuel and petrochemical dependence of our medical system is to form the basis for the orderly planning of a rational response to the ensuing gradual depletion. We will need to plan to mitigate, as soon as we reasonably can, the impact of oil depletion and in the process establish a list of priority activities that will need continued access to fuel and petrochemicals regardless of price and availability. The Australian Healthcare system needs a comprehensive oil vulnerability analysis as

soon as possible to provide the information on which to develop migration strategies.

Some of the observations, conclusions and proposed solutions will seem, to many, at first glance to be outlandish and even absurd, but consider that we are addressing the prospects for healthcare in a totally new and uncertain period. Humanity has never experienced anything as widespread and world changing as peak oil. From the time of the peaking of the world's oil supply there will be less energy and less oil based material every year, year after year, for ever. If the rate of depletion is 7% pa, which is conceivable, then the amount of oil which is produced will decrease by half every 10 years – for ever. So when we address the issue of how much plastic we use and discard, for example, it is not a contrived or frivolous point, the time when we will not have access to affordable disposable plastic is not far in the future. Given the total absence of any plan to find an alternative, which will take years to develop, it might as well be tomorrow.

We need to be prepared to ask hard questions and think the unthinkable; the seamless progress of more and evermore complex procedures and treatments will not be sustainable. Things are not going to get easier; they are going to get harder and harder every year. We will have to struggle not to go backwards. Medicine in Australia will still have the potential to be world class, it will require those in the system to be inventive, flexible, frugal and creative as we power down. Our future will not be a linear extrapolation from our past because we are approaching a period of unprecedented change. Rather than looking forward breathlessly to the future and dreaming about how stem cells will be curing all sorts of ailments in 2030, we should really be asking deeply disturbing questions like: How will we be able maintain vaccine production for childhood immunization in 2030 and beyond?

We need to ask the right questions, two urgent questions for starters are:

- What level of complexity will we be able to sustain 2, 5, 10, 20 or more years into the period of energy descent that will follow on from peak oil?
- What will be the appropriate level of complexity that balances cost effectiveness with the best possible outcomes?

This submission is in large part a list of questions and challenges, there will be more, many more, and we will need to start finding the answers soon. Peak oil is expected within 4 years and may already be upon us, global oil production has fallen over the course of the calendar year to date.

The Impact of Peak Oil on Medicine

A. Ways that modern medicine is oil dependent: An overview.

Most of our modern medical system is oil-dependent, just like the rest of society. Oil has been so cheap for so long that it has become a pervasive presence in health care delivery. This impact is most obvious when one looks at the transport systems required to maintain a health service. Just as suburbia has been subsidised by the endowment of cheap and plentiful oil, modern medical care is predicated on the cheap movement of things and people from one place to another. This cheap transportation is so crucial that the system must fall apart if no alternatives are developed before oil becomes scarce and even more expensive. This first part of the submission examines these issues from the perspective of large hospitals - they represent one of the most centralised expressions of health care delivery, and will probably become one of the first major casualties of peak oil.

1. Transport

Modern healthcare facilities are open systems that consume inputs and produce wastes. With few exceptions, almost none of the inputs are created on site, and must be brought to the facility (usually by road). Examples include food, medical supplies, linen, and medical gases like oxygen. Outputs include general rubbish as well as clinical (i.e. contaminated) waste that requires special handling and disposal (either landfill or incineration). The other big transport category is people - staff, patients, visitors and students need to travel to and from the site.

2. Direct Content

Many items used in modern medicine contain petrochemical derivatives. Some of the main categories are gloves (synthetic rubber), clinical disposables (like syringes), medications, sterile packaging (mainly plastic), high-tech equipment like CT and MRI scanners, and computers.

3. Embodied

Many items that don't directly contain petrochemicals do have oil-based products embodied within them. Producing stainless steel or titanium joint-replacement components may require oil at several steps, including mining, refining, manufacturing, transporting, and packaging.

4. Energy Production

There are two main categories - offsite (natural gas-fired power stations) and on-site (oil or gas for heating and steam generation).

5. Processes

Activities within hospitals like laundering (hot water) and equipment sterilisation (steam, plastic packaging, ethylene oxide) might be oil-dependent.

6. Roads and Buildings

Maintaining and constructing buildings and roads may include multiple oil-dependent processes.

7. Emergency Services

Our present vehicle based emergency services using cars, trucks, planes and helicopters etc. require reliable access to fuel.

8. Organisational and Political Systems

Healthcare services exist within the complex system of modern society. They currently reside within a hierarchical structure of local, state and federal government, health insurance companies, vocational colleges, registration boards, and many other political and pseudopolitical entities. All are currently dependent on oil to a greater or lesser extent (especially for transporting people and things).

Outcomes

So what changes could peak oil bring to our health-care system? Like the impacts on the rest of society, it will partly depend on the rapidity of oil scarcity and the amount of preparation. In the short term there will probably be decreased and unequal access to services, rationing, and a reduction in quality of life (we might be sicker, more mentally ill, and not live as long). In the longer term, a successful transition will need to involve more personal responsibility for one's own health, as well as a more informal and dispersed health care system centred on the small-community / village level.

In this submission the health system has been examined under the headings of hospital medicine and general practice. We foresee that in response to peak oil the two will come to share an expanded common ground of merged interaction and cooperation.

B. Critical aspects of the organisation of hospital medicine vulnerable to peak oil

1. Centralisation

There has been for years an increasing trend to centralise services which is driven by:

- The cost of resources, the need to minimise duplication and to extract maximum use from equipment and institutions with huge capital and operating costs.
- Medico-legal pressure to have as many services as possible provided in centres of excellence with expertise in uncommon conditions.
- Shortages of qualified staff

This process is continuing and gathering pace, it must be reassessed in the light of peak oil. The NHS in the UK is currently proposing to downgrade facilities at a wide range of hospitals and relocate them to “Super- Hospitals” to save money. Even at present levels of fuel prices and within the existing limits of mobility, this proposal is causing alarm. The added impact of peak oil will tragically show this to be a lethal and short sighted error of judgement.

(<http://news.bbc.co.uk/2/hi/health/5259446.stm>)

2. Distance to travel

The consequence of centralisation is that travel from outer suburbs to specialist facilities in city centres can involve long distances, unwell patients can not easily use public transport, they must drive or be driven and hospital staff, who are required around the clock, are likewise dependent on their cars.

The situation is much worse in regional and rural areas where the downgrading of rural hospitals and the loss of services means that trips of hundreds of kilometres and long absences from home are the norm for seriously ill patients and pregnant women close to delivery.

The end of cheap fuel will challenge the assumptions on which our centralised health care systems functions.

3. Dependence on imported drugs and technology.

Of all the drugs, disposable and reusable equipment in Australian hospitals only a tiny fraction is locally sourced. In terms of physical inputs our healthcare system is almost totally dependant on imports. The price of plastic is rising in line with the price of its progenitor, crude

oil. As Australia becomes ever more dependant on oil imports, we will be importing 60% of our oil in 4 years, our balance of payments will dramatically worsen. So Peak Oil will not only increase the absolute cost of inputs to the health care system, it will dramatically impact our ability to pay for them. With regard to drugs we will soon need to reassess which of the many variations on a pharmacological theme are really necessary and then we will need to urgently assess what drugs can be made in Australia, the local generic drug industry will become very important.

The international logistical chain which supplies all of the physical inputs to the healthcare system will be challenged by the consequences of peak oil. No one knows what is going to happen to international trade in the post peak oil environment. Drugs, which are overwhelmingly petroleum derived, represent an extreme case of value adding and will doubtless continue to be made, but in what volume and at what price? The current model of just in time management of supplies may prove to be unreliable, much too unreliable for life saving equipment and drugs. Hospitals and regional health authorities may need to have reserve supplies of everything on hand.

4. Dependence on disposable products

The trend in hospital practice is to ever more disposable, single use equipment. In recent years this has reached the ludicrous extreme of having single use stainless steel surgical forceps, needle holders, scissors and scalpels for some procedures. Many who work within the hospital system are so appalled by this waste that they divert these instruments from the rubbish and clean them in preparation for dispatch by charity to third world hospitals, where they are gratefully accepted, routinely cleaned, resharpened and reused hundreds if not thousands of times. Lower on the scale of profligate waste is the routine use of disposable paper in place of washable linen drapes, for surgical procedures. This is promoted as an infection control exercise but the main reason for the change is the reduction in cleaning manpower required. The imbedded energy of the material being discarded daily by the tonne will soon represent an intolerable cost burden. The trend to disposables should be resisted and a return to reusable products wherever possible should be investigated. To paraphrase Dr Samsam Bakhtiari in his testimony to this inquiry: We have to reduce waste and reuse whatever we can.

5. Complexity

Complex medicine exists imbedded in a complex society. The complexity and level of specialisation of a society is closely related to energy consumption. In societies with little access to energy, the production of food occupies the majority of the population. In our western societies 2%

of the population can feed the remaining 98% by the use of prodigious quantities of oil. Modern farming has been described as “using land to turn petroleum into food”. This has allowed the proliferation of occupations in science, technology, medicine, industry, education, government, the arts, finance etc.

The economic complexity and niche specialisation in our society is like the interdependence of organisms in a complex ecosystem. In biology the most specialised organisms and ecosystems are the least able to adapt to the stress of forced change. The most generally adapted and the most flexible organisms are the survivors. In the high energy input Amazon jungle there are hummingbirds that feed on a single type of tree. In a low energy environment like Alaska, the archetypal animal is the kodiak bear which can eat anything it finds. What will happen in our energy intensive complex society when the supply of 1000 barrels per second of oil on which it depends, starts to fail? Will we see a decrease in the level of specialization and a return to an earlier model practice, where each practitioner’s scope is wider and more flexible.

In this scenario what might become of modern hospital medicine?

Medicine is already straining national and household budgets throughout the western world. Most of the cheap and easy to treat conditions in the western world have been addressed with varying degrees of success. More and more money and effort is being expended to treat more and more expensive conditions for marginal gains in safety, longevity and quality of life. Medical inflation is dramatically outpacing general inflation. The inflationary effects of peak oil will widen this gap.

The complex intertwined research, development, manufacturing, transportation and logistical chains of the industries that provide everything from aspirin to MRI scanners; all the drugs, disposables, dressings, in short all the things we use in medicine, will be strained by peak oil. Input costs will rise and the purchasing capacity of national economies staggering on the brink of depression will fall when industry, employment, finance and investment are all hammered by peak oil.

All this is happening as the whole health system rapidly approaches the huge demographic discontinuity of aging baby boomers, a cohort about twice the size of generation preceding it, with their unbridled expectations of a healthy, active old age.

C. Remodelling Hospital Practice in Response to Peak Oil

1. Relocalisation

Life in the Post Peak Oil world is going to be much more locally based. We need to urgently plan for our food security and promote local, organic, sustainable food production, local industry, local employment and vibrant local economies. When travel is too expensive, when incomes fall or vanish, when food trucks no longer arrive every day from far away; people will only be eating what they, their neighbours and their communities grow close to home.

People will have to obtain locally just about everything including healthcare.

This forced reduction in mobility will also require us to rethink the delivery of health services, large facilities dependent on car transport will have to be re-evaluated.

There will have to be something of a shift from centralised hospital treatment to an increased emphasis on GP treatment at the local level. Referral to hospital for advanced treatment will continue for the foreseeable future, however as the implications of energy descent become greater over time, the absolute level of complexity of care that can be sustained even in tertiary centres will inevitably decline.

This movement of treatment away from the centre will result from decreased patient mobility and the resultant need for GPs to do more in the way of definitive treatment. GPs in country hospitals will be doing some of what is currently done in secondary referral hospitals. When patient mobility is restricted, with a trip by car of hundreds of kilometres out of the question, and if regional/rural areas see their populations start to increase again as big cities become increasingly unattractive places to live, the role of the rural doctor is going to have to change greatly.

We will need to manage risk and accept risk-benefit trade offs that might be currently unacceptable. Is legally driven decision making still going to be a viable response to risk minimization? We can't really eliminate all risk now and will be much less able to do so in the future. When GPs, particularly in rural areas, find that they are called on to do more including more complex procedural work for patients who cannot travel to large centres, they will need to be supported, insured and adequately trained. How will they get this support, insurance and required training?

GPs in the suburbs will also have a change in their role, rather than travel to hospital out of hours for a primary diagnosis, patients will increasingly have to be seen by their local doctor, to determine if the onerous and expensive journey to hospital is really required. This could take place at an existing general practice or at a new local healthcare facility.

These facilities could be provided in redeveloped local free standing facilities, which could function as GP surgery, visiting specialist rooms, pathology, medical imaging, allied health, day surgery units, and accident and emergency centres.

Consultative and procedural work done could be done there by travelling specialists. The local centres could easily be accessed (on foot, by electric “gopher” or community bus) by large numbers of otherwise stranded patients. It will be much more efficient for one specialist and one or two staff to travel to a centre which 40 patients can reach with ease than for all 40 of them to make the difficult (impossible?) journey to a central clinic.

These centres could also house local day surgery units which could function one, two or more days a week with a minimum of fixed equipment and a well set up van that moved the other gear around and a small bus that ferried the required staff from place to place. Localised, probably GP staffed, A&E facilities will be needed around the clock when people in outlying suburbs and towns do not have the option of just hopping in the car and going to hospital. House calls will become common again. Some patients will obviously still have to come to regional centres, but maybe the model should be triage then travel. This is further discussed in the section on remodelling general practice under the heading “Localised Centrality”

Relocalisation is further analysed and discussed in Appendix 1

The role of the country hospital will have to change, taking on work that is currently the domain of regional hospitals and providing a higher level of care for stranded patients. The model of the flying surgeon based in Longreach in Queensland provides a model for the delivery of specialist services by travelling medical teams. Peak oil is going to render much of Australia as isolated in the future as outback Queensland is now.

2. Reduce, reuse, recycle, repair.

The imbedded energy of everything will become an increasingly important element of price. The current trend towards disposable single use equipment will have to be reversed in favour of reusable equipment. Not

only will this likely save money as prices rise, but the reusable equipment will always be available when the continuous, just in time, warehouse-on-wheels supply chain of the use-once-and-throw-away equivalent has broken down. This breakdown could happen for lots of reasons ranging from the price or unavailability of feedstock delaying manufacture to the cost of trucking fuel.

The issue of reliable essential medical equipment and the development of a robust local system of maintenance will be a major challenge. Many questions will have to be addressed. What sort of equipment is indispensable? What is the minimum needed in an operating theatre? What is the minimum needed for intensive care? Do we have to be able to make some equipment in Australia? Can it be maintained without recourse to exotic spare parts? Will imported parts be available when needed? Can serviceable equipment be made using generic, off-the-shelf, modular components? Can this equipment be repaired by a skilled non specialist technician?

D. Aspects of Australia's Current General Practice Model Vulnerable to Peak Oil

The current model of general practice in Australia is critically reliant on road transport. The average general practice has many transport-based "interactions" each day. In common with the rest of our healthcare, it is currently an open system, typified by one-way flows of materials and energy, with relatively little recycling.

The various interactions of daily business can be characterised as inputs, outputs, and two-way flows. This discussion focuses on the oil-dependent processes that are an essential part of modern general practice.

1. Inputs

The main oil-based inputs are medical supplies and other consumables, drugs, and technology and equipment. The non-oil inputs include electricity, water, and financial transactions like rent, rates etc. This paper will focus solely on the first group.

Medical supplies and other consumables

Items in this category are often made of petrochemicals, contain embodied oil-based energy (during processing and manufacture), have been sterilized by an oil-derivative (ethylene oxide), are transported to the general practice by road, or a combination of these factors. A special case is plastic-containing items. They have become a ubiquitous part of daily practice, yet we have no ready substitute. These will increase in cost in

line with oil. Eventually substitutes will have to be found. Their replacement will pose many technical, economic, and infection-control challenges.

Drugs

The drugs related to general practice are essentially the same as for hospitals with the difference that patients have to travel from their GP to a pharmacy to obtain their drugs.

Technology and equipment

Most general practices these days are computerized. All computers rely heavily on plastic for manufacturing. These areas include the computer case, monitor, keyboard and mouse. Importantly it also includes many internal hardware components, including the insulation around electrical wiring (without which computers would short out and fail). Compact discs and DVDs also contain plastic. Other medical equipment may also contain plastic or embodied oil-derived energy.

2. Outputs

The main output of a general practice is the abstract idea of “healthcare delivery” or “medical care”. In general terms, inputs are consumed to deliver the service, and wastes generated that need to be disposed of.

GP service delivery

General practice services may be delivered at any of several locations. On-site delivery (at their practice building) is the focus of most GPs, and it probably consumes the most resources and generates the most wastes. Private dwellings and nursing homes are generally the other two most important off-site locations. Emergency service provision and on-call responsibilities are also important, and the auxiliary services of pathology and imaging must be considered as well.

(i) On-site

Most of the work done by many general practitioners is in their surgery. This is the main place that most patients attend, and it is the location where most supplies are consumed and waste generated. The delivery of primary care in the general practice setting usually also requires pathology and imaging services.

Pathology is both transport- and time-dependent, and intensively uses road transport. The system is often based on road-couriers who drive to a “run” of general practices several times per day, primarily to pick up specimens, but also to deliver pathology reports and supplies. The collected specimens are then driven to a laboratory to be processed. Note

that this service is time-sensitive and requires rapid and reliable transport to be successful.

The current pathology system also uses a mountain of plastic, including disposable needles and syringes, plastic blood tubes and specimen containers, and then double-pocket “biohazard” plastic bags for safe transportation.

Radiological services are less transport-sensitive as patients are required to attend a practice to have the imaging done. Imaging machines however contain plastics or are dependent on computers, while x-ray films also contain plastic (acetate or polyester)¹ as well as embodied energy in the form of silver (diesel and other oils are used for mining, refining, processing, manufacturing and transport).

(ii) Visits to private dwellings

The majority of visits probably involve the general practitioner driving to the house in a car. Groups using this service include:

- Generally healthy but acutely unwell patients who can usually attend a practice but are too acutely unwell to do so.
- Elderly patients living at home who usually receive regular home visits.
- Disabled or otherwise infirm people (sometimes living in a group home with several other people) who also receive “routine” home visits.

It is obvious that a sudden absence of car-based transport (due to an even short-term crisis) could severely limit home visits and put particularly vulnerable groups of people at high-risk of not receiving care. In contrast, a long-term shortage of transport fuel would ensure that alternative care arrangements would need to be made.

(iii) Nursing home visits

I have considered these separately because a general practitioner who regularly visits a nursing home often sees several patients during the visit. Any peak oil strategy must include consideration of nursing homes (unless a completely different model of aged care is pursued) because:

- Elderly nursing home residents use proportionately more healthcare services than younger patients.
- The number of elderly patients is likely to grow enormously over the coming decades as Australia’s population ages.

¹*The dangers of cellulose nitrate film* by the UK Health and Safety Executive Information Service, Caerphilly Business Park, Caerphilly CF83 3GG (2003): <http://www.hse.gov.uk/pubns/cellulose.pdf>

Caring for the aged in the future will impose a progressively greater burden on health and aged care services, and will be challenging in terms of staff and facility provision. In terms of transportation use, the provision of medical care to the aged in nursing homes is an interesting model because it is efficient in terms of both the doctor's time, and fuel use.

Waste generation

Waste is currently removed from a general practice by local council garbage services (general waste) and specialized services (contaminated waste including sharps). Contaminated waste disposal is very oil-intensive, as well as being plastic-dependent.

Waste is collected from practices by light truck or van, and taken to centralized transportation points where it is loaded and shipped to disposal sites (either incineration or burying). All of these steps require oil-dependent transport, unless electrified rail is used as the final leg.

Contaminated waste disposal is also plastic-dependent. Sharps are placed in thick plastic containers that are destroyed with the sharps and cannot be recycled (aside from the issues of infection control and needle-stick risk). Non-sharp waste is collected in thick plastic bags inside large plastic waste receptacles. While the collection containers are cleaned and reused, the plastic bags are destroyed along with the waste.

3. Two way flows

There are several two-way flows through the system. The ones included here are surgical instruments, linen and the most important one: patients. Each of these items are transported into the general practice, and at some point leave it essentially unchanged, and are not turned into waste.

Patients

The biggest group in this category are patients. I have classed them as two-way because they travel to the practice; receive "medical care"; and then travel back home. Currently, the general practitioner usually remains stationary, while patients travel to and from a fixed practice. A lot of petrol is used up by patients, given that an average general practitioner might see between 20 and 30 patients per day, and that (dependent on local facilities) many patients may drive to their appointment.

In the Australian system, patients are allowed to choose whichever GP they want. They may live 90 minutes or more away, and drive past several other practices on the way to their preferred one. After the

consultation they may have received a medication prescription, so they drive to the pharmacy before heading home. Hence there is sometimes a lot of petrol involved in attending the doctor, and possibly a round trip of 100 kilometres or more, even in urban areas. Attending a rural general practice may be even more fuel-intensive, depending on the location. And even in the capital cities where public transport is available, people may prefer to drive for reasons of convenience, safety, or accessibility.

Linen and surgical instruments

Linen is often collected from the practice and laundered off-site before being returned. This is often done by car or van, depending on the amount of linen. There is therefore an embodied fuel cost. While not as important to general practices as it is to hospitals, linen services do increase the amount of fuel consumed by general practice. Surgical instruments may be sterilised by a specialised off-site service before being repackaged and returned, again by van or car. The same transport issues apply as for linen. Where the sterilising is done on-site, plastic-lined sterilising pouches are often used, and supplies like distilled water are needed (currently packaged in plastic bottles).

4. Practice location and ownership

Many practices are small businesses that are owned and operated by a small number of doctors. A relative few belong to the large corporate operators who have been active over the last few years. Because they are privately owned, practices are free to be set up and operate where and how their owners wish (within local, state and federal regulations).

While practices are spread throughout the country, it is well known that rural, regional and some suburban areas are relatively underserved by GPs, while the more affluent areas are overserved. So while practices are generally located within communities, they are not evenly distributed. Some patients can easily walk to their local GP, while others (especially in larger urban areas) can use public transport. In urban areas where public transport is unavailable or unsafe, patients may choose to drive. In contrast, rural families may need to travel a long way to the doctor, and have no choice but to drive, regardless of petrol prices or availability.

Because of the heterogeneity of general practice distribution, any re-organisation of the healthcare system, as a response to peak oil, would require some general practices to relocate, so that all communities would have equal and local access to primary care. The issues of practice

ownership and compensation would need to be resolved if any such action was contemplated.

5. Summary

Most aspects of the current model of general practice require fossil fuels (especially oil and its derivatives). Transport is a major issue and the most important short-term vulnerability of the system (see our discussion about the UK crisis). Our current primary care system can only stay as it is, and retain its stability, as long as there are cheap and abundant oil supplies available. Any disruption to oil supplies, even of a few days, could cause serious community impact. The dependence of all of our technology on oil and its derivatives will make us vulnerable to cost increases in the short term and scarcity in the long term.

E. Remodelling Australian General Practice in Response to Peak Oil

It is clear from the preceding discussion that the current model of general practice in Australia will be unsustainable in a scarce oil future. So the question remains: how can it be remodelled to be more sustainable within the limitations imposed by peak oil, yet still deliver effective and ethical health care to our population?

1. Structure versus technique

One needs to separate the structure of a future healthcare system from the knowledge or techniques used by practitioners within it, to begin to answer this question. For example, consider a book: the chapter structure provides a framework for the knowledge contained within it. And while most books share the concept of chapters as an organising system, the content of each book is different. And so it will be for the pattern of healthcare. The reduction in travel and material flows brought on by peak oil will necessitate a greater reliance on local materials, knowledge and infrastructure, with greater heterogeneity in the way healthcare is delivered. It will be guided more by local factors than it is now, and feature a range of customised solutions to the problems of healthcare delivery in each region.

2. Focus on principles

This section will focus on some principles that might be used for designing the structure of a possible future system. Due to the difficulties of foreseeing the exact nature of the challenge posed by peak oil, we have attempted to provide a “big picture” consideration of the more theoretical and ethical factors that need to be considered, rather than a prescriptive list of specific solutions. After your reading of this

submission, we hope to have raised more questions than we have answered.

3. Redefining general practice

The terms general practice and primary health care sometimes seem to be used interchangeably, although conceptually they are different. I make this distinction because primary health care, while including general practice, encompasses a wider sphere of activity, as it involves health care workers other than doctors, and activities other than medicine (such as health promotion and community nursing, for instance).

4. Bringing people together

After peak oil, the fundamental question to be answered will be: “How can we bring doctors and people together without using oil-based transport?” Two related questions are “Where should general practitioners be located within the community?” and “How will people move around without using oil?” There are at least four possible ways to structure an answer to these questions:

1. Localised “centrality”

One possible model of local medical reorganisation is through the related processes of delegation of healthcare responsibility and triage. As currently used in some developing nations, this model involves a large number of semi-trained community health workers, scattered throughout the community, who would provide basic first-aid and simple medical treatments. Training in triage would allow these workers to identify the more unwell patients, who are then passed upwards through a series of facilities of increasing medical complexity, with most doctors sitting close to the top of the organisational structure. They would provide more specialised treatment to those who needed it, as well as be responsible for passing education and feedback down the chain to their subordinates.

2. GP dispersal

In this model, general practitioners would be dispersed throughout the community, ensuring that essentially all people in urban areas could access a doctor by walking or riding a bike (or horse in country towns). This system would involve a reversal of the current trend towards practice amalgamation, and would see many small one or two doctor practices developed in the same pattern as population clusters. This perhaps is most like the way that general practice developed in Australia, with many combined residence/surgeries scattered throughout a community.

3. Nursing home multi-use

This response recognises the ageing of Australia's population, and the progressively increasing need for aged care that will result. It also acknowledges that the aged use proportionately more medical care than younger people (up to eight times more than children has been quoted), and also that there are likely to be flows of people (staff, relatives and visitors) and materials (including food and supplies) into nursing homes, making them a focus of activity within the community. It doesn't consider whether or not nursing homes will remain as they are, or whether caring for the aged will once again be done by their own families at home. This strategy would see general practices established at nursing homes (to make use of the flows of people and materials), and perhaps an even greater expansion of the nursing home role to include other essential healthcare services, community gardens, urban farms, and other localising efforts. In this scenario, the nursing home becomes a hub of community activity.

4. Medical "flying squads"

This is an old idea made new again and is possibly a subset of the first strategy: mobile teams of general practitioners, surgical teams, medical specialists, allied health professionals, or multidisciplinary teams would move around community facilities and private residences to provide care as needed. This option could exist within the triage and delegation structure, and would be particularly important in rural areas (akin to the Royal Flying Doctor Service but on wheels instead of wings.).

5. A holistic view

While the focus of this submission is on healthcare, we must remember that our medical system is a subset of wider society. While it needs to be seen as an essential part of societal redesign in response to peak oil, it will likely be made subservient to the wider design solutions that evolve in our country. It must be stated that the redesign of the healthcare system will be time-consuming and costly, as it will be for the rest of society. We have no time to waste.

6. Inclusion of Indigenous Australians

Any redesign of Australia's current healthcare system must include and value the contribution that can be made by indigenous knowledge, as well as ensuring that adequate, accessible and acceptable health care is provided.

The challenges of providing adequate care to, and improving the health, longevity and quality of life of indigenous peoples are well known. While these challenges will continue to be present in any peak oil response, they must not be shirked or ignored.

A perhaps less appreciated issue is the potential that indigenous knowledge might have to help us navigate the next step in the evolution of our culture. It has been developed over the millennia by careful observation and connection with the land, and passed to younger generations via a rich oral tradition. Indigenous peoples the world over have an in-depth knowledge of the ways to identify, find, prepare and use medicinal plant species. This information could well prove vital to our future survival, and should be urgently collected, collated, researched and disseminated.

There are two needs for urgency. The first is that the ageing and passing on of traditional healers results in a permanent loss of knowledge, as most has never been written down. Additionally, as traditional ways and practices may not seem so attractive to younger community members, and as there has been a general disconnection with the land in many places, there may have been no-one to pass it on to. The remoteness of many communities greatly increases their vulnerability in a post peak oil environment.

A second need for urgency is the uncertain timing of peak oil – all efforts to prepare should be started as quickly as possible to maximise its mitigation and minimise the impacts.

It is also worth considering that traditional knowledge is intimately linked to the land and in modern terms has already been “relocalised” (or more accurately, never “globalised” or homogenised).

7. Some design questions to consider

This submission perhaps raises more questions than it answers, but at this early stage of our response to peak oil, we think that it is important that our subsequent actions be guided by a series of questions and ethical principles. The way that the puzzle of providing health care in a scarce oil future is resolved is likely to be intensely local, heterogeneous and granular (focussed on the small scale and the use of appropriate technology, rather than large scale and high-tech). The unanswered questions relating to the future structure of general practice include, but are not limited to:

- How can most people be seen by a GP using a minimum of fuel?
- How can we redistribute general practices within the community to ensure local and equal access for people?
- What ethical principles need to guide this redistribution (discussed later in this submission)?

- How can we ensure the continuation of medical research, professional education and peer review in the setting of significantly decreased personal transport?

F. Demonstration of the vulnerability of the health care system to fuel supply disruption.

The advent of Peak Oil will not bring about an overnight crisis in the health system. However the analysis of the September 2000 UK fuel crisis and its impact on the health care system in that country is very instructive, it shows the dependence of our system on oil in clear relief and provides a time compressed view of the future we can expect if we don't respond with adequate planning, starting now..

1. Background

What started as a protest by fishermen, farmers and truck drivers about rising fuel prices resulted in a national crisis. The result of the blockade was that supplies of petrol and diesel were unable to get from refineries to petrol stations, resulting in an acute fuel shortage across Britain. The crisis was resolved after eight days, following appeals to the good-nature of the peaceful protestors about the effects of their actions on the country.

2. Effects

One of the most severely affected sectors was health care. Although an attempt was made to provide preferential fuel supplies for health care workers, it was not widely successful. The crisis was generally worse in remote and country areas that were heavily dependent on transport.

Media reports from the time documented the problems, including:

- Inability to discharge patients because their relations couldn't travel to the hospital to pick them up.
- Closure of outpatients departments.
- Severe shortages of blood products, drugs, sutures and linen.
- Cancellation of all elective and non-emergency surgery.
- Shortages of hospital staff because they couldn't get to work.
- Severe limitation of ambulance travel, with activity limited to emergency calls only.
- Inability of community nurses, general practitioners and other community-based workers to visit their patients. One GP was planning to do home visits on horseback when the petrol ran out.
- Accumulation of contaminated waste because it couldn't be collected.

3. Commentary

We should see these events as a simulation of what might happen in Australia if there is a sudden fuel shortage. It should be noted that we are probably much more dependent now than the UK was then, due to Australia's size, and our emphasis of car and truck transport over electrified rail.

Although the focus of this submission is on oil peaking, it should be noted that there are many other potential causes of a short-term fuel shortage, similar to that experienced in the UK:

- Terrorism.
- Industrial action.
- Natural disasters (storms or bushfires).
- Accidental emissions, equipment failures or explosions (for example at a large oil refinery).
- International events (for example Middle East military action or terrorism, SE Asian piracy, accidents in the Strait of Hormuz etc).

It also highlights the dependency of our current system on transport. These events should be taken as a warning of what could happen in Australia at any time - our system has evolved to be similar to that in the UK, and just as vulnerable.

4. Implications for peak oil

The blockade and subsequent disruption shows that we have designed our society to be vulnerable to an even short-term decrease in energy supply. It also demonstrates the presence of (sometimes unsuspected) bottlenecks where a few people can create major havoc.

It's worth noting that this crisis was entirely reversible and consisted of a relative reduction in oil flow for a short period of time. In contrast, peak oil will produce an absolute and permanent reduction. The distinction is important for two reasons.

Firstly, the UK protests caused a TRANSPORTATION crisis only, preventing people and things from moving about. There was still a normal amount of all the things that we currently take for granted (like food and clothing), it was just that they couldn't get to where they were needed. Even if farmers didn't have diesel for their tractors and trucks, their crops were in the ground growing and their finished produce was in sheds waiting to get to market.

In contrast, peak oil will not only limit oil-based transportation, but it will disrupt the manufacture of everything containing petrochemicals (i.e. all plastic, synthetic clothing, kitchen appliances, computers). They will

not be sitting in warehouses waiting for normality to resume. They will not be there in the first place. So energy descent will not present only a transportation challenge. Secondly, the crisis ended in just over a week, allowing things to get back to normal quickly. Peak oil will be permanent, and there will be no quick fix.

5. Recommendations and Responses

1. Development of a fuel-shortage crisis plan, ready to be implemented quickly when needed. (Rationale: there won't be time to start from scratch in a real crisis).
2. Real-time simulation of a short-term fuel shortage, once the plan has been completed, to evaluate and refine it (Rationale: A simulation called Oil Shockwave was run in the US two or three years ago and had a lot of interesting findings).
3. Develop a strategic stockpile of essential medical supplies and the fuel to get them out to hospitals and other health care facilities (Rationale: Can be done quickly and will reduce the impact of a shortage, while longer term options are implemented).
4. Consideration of how essential workers (including health care workers, but also emergency services personnel, SES, electricity workers and others) can have preferential access to fuel in a crisis. Alternatively, how government authorities can transport workers where they are needed (Rationale: Limitation of services due to the inability of people to reach their workplaces was a major factor in the UK crisis).
5. Longer term, consideration of how the Australian health care system can be made less dependent on oil. (Rationale: even if oil peaking is 20 or 30 years away, it will take a long time to achieve a fundamental redesign and reconstruction of our system. If it is closer, then any move in that direction will reduce the impacts of the event).

G. Summary and Conclusions

The impact of peak oil on the Australian healthcare system will be shatteringly profound. Peak oil is not a theory it is an observable fact. We have no time to lose.

This submission has examined some of the potential problems but has only scratched the surface. We need to initiate studies on the impact of peak on the Australian healthcare system. This should take the form of a "top down" mitigation study informed by a wide range of "bottom up" oil vulnerability analyses.

Until this is done we won't have the information to plan in a logical and practical manner.

Mitigation study: Australian healthcare "Hirsch" report

Most peak oil studies to date have focussed on trying to predict when oil peaking might occur. There is one notable exception, however. In 2004 the US Department of Energy's National Energy Technology Laboratory released their landmark *Peaking of World Oil Production: Impacts, Mitigation and Risk Management*.

Unlike the others, this study (informally called *The Hirsch Report* after the lead author – who appeared on the recent ABC-TV Four Corners episode on peak oil) made no attempt to predict when a peak might occur.

After identifying that peak oil would cause a liquid fuels crisis, it looked at how long it would take to replace oil as a transport fuel. The authors calculated that it would take 20 years of "crash" programs to produce enough facilities to significantly replace oil with artificial fuels. In contrast, if the US waited until peaking was obvious, there would be 20 years of significant economic hardship (similar to, or worse than, the Great Depression).

We contend that a study with a similar purpose would be a useful tool for the Australian healthcare system. It would provide useful information for planning and implementing mitigation programs, allowing us to manage the significant expected impacts of oil scarcity and energy descent.

The authors of the Hirsch report purposely kept the analysis simple. They did this so that their results would be transparent. They acknowledged that no study could infallibly predict the impacts, and used a semi-qualitative approach, rather than a rigidly quantitative one. In simple terms the approach was:

1. Describe the current situation and identify the scope of the problem.
2. Consider any examples or analogous situations that might shed light on the analysis (they used the peaking of US domestic natural gas supply).
3. Only consider commercial or near-commercial processes (to maintain realism).
4. Calculate the timeframes and capacities of the necessary number of fuel-production plants.

5. Repeat the process for each technology (eg coal-to-liquids; vehicle energy efficiency).

In order to think about how this process might be applied to our problem, we chose the hypothetical example of disposable plastic syringes (with a possible proposal to replace them with reusable glass ones). A possible series of steps similar to those described above are set out below:

1. How many single-use plastic syringes are used each year in Australia? What sizes? Where are they used (eg hospital versus community)? What are they used for? Who makes them? Which countries do they come from?
2. What happened in Cuba when their oil supplies were cut off? How about Zimbabwe (a country that has been called the “first casualty” of peak oil)? How do NGO aid-agencies like MSF currently handle this issue in third-world countries? What lessons can we distil? For example: What alternatives are there? If glass syringes will be used, how can they be made, packaged and shipped safely? How might they be cleaned, sterilized and reused? What are the infection control issues? And so on.
3. What viable processes currently exist to manufacture precision glass instruments in Australia? Who might do it (eg consider scientific instrument makers but also manufacturers of glass bottles and jars)? What is their current capacity? Do they have the technology or would it need to be bought from overseas and adapted here?
4. Educated guesses about how long it would take to build and tool up enough factories to make them (in the format of “Complete X factories per year, each producing Y syringes per year, Z years lead time until the first one is operational then 1 per year thereafter”).
5. Repeat this process for each important oil-based component of the current health-care system. Such a study would be much harder to do than the original one, because Hirsch *et al* only considered one output; we need to consider many.

One would also need to try and predict the increased sterilising load (both in staff and equipment terms), infection control issues, financial costs and benefits, patterns of use, etc.

The possible outcomes of such a study include:

- A reasonable idea of the enormity of the problem and the scale of mitigation required.
- An estimate of the number of years needed to significantly reduce our current dependence on oil-based materials, allowing timeframes for implementation to be developed.
- Identification of the critical areas of the current healthcare system that need urgent attention.
- The realisation that perhaps a stockpiling strategy might be favoured over developing domestic manufacturing capacity.
- A complete redesign of the current system (really a paradigm shift) to the new ways of delivering satisfactory health care discussed in this report.

Oil Vulnerability Analysis

We propose that the best way to gather the required information for an informed mitigation study would be to seek out, collate and analyse the input from many people in the workplace, those who can see with practical clarity what the impact of oil scarcity and price rises will mean for their contribution to healthcare. These individuals and the organisations within which they work could contribute this information by undertaking an oil vulnerability analysis.

This would need to be done at multiple levels. Starting with a representative sample of working individuals from every part of the healthcare industry and then working up through each ascending level of complexity. In the medical realm this would go from general practice and hospital doctors to specialists in every field and then on up through hospitals, regional health services and state health departments to the federal department. The same process would have to be worked through for hospital nursing services, nursing homes, ambulance services, community services, allied health etc. Private corporations and professional organisations such as the AMA and ANF will also have significant contributions to make.

Duplication of administration between state and federal departments is already a huge waste of resources and has the potential to derail a rational response to oil depletion. The federal Department of Health and Aging should establish an Oil Vulnerability Office to coordinate and facilitate oil vulnerability analysis as a matter of urgency. Patterns of practical and sensible responses would soon emerge from all of the information collected. This would form the basis for mitigation planning.

Much can be learned from the collected and shared wisdom and experience of some of the millions of Australians working in healthcare.

Our healthcare system is now totally dependent on oil. Our oil supply is soon going into terminal decline. How will the healthcare system cope as rising oil prices push petrol and diesel to \$2, \$4, \$5 or \$10 dollars a litre and increase, by a factor of ten or more, the cost of everything we currently use and then mindlessly throw away?

In the words of Albert Einstein: “The significant problems we face cannot be solved at the same level of thinking we were at when we created them.”

Appendices

Appendix 1: Techniques of relocalised healthcare.

The focus of this section is to explore how the tools, materials and techniques that are used by doctors can be made to be sustainable.

Relocalisation

By the very nature of relocalisation, a myriad of small niches and individual situations are created, each with a series of challenges to be successfully negotiated. Such an idea is the opposite of globalisation, where we have seen a homogenisation of global culture, the destruction of regional economies, and the degradation of local facilities and infrastructure. Inherent in this phenomenon is the “one-size-fits-all” solution that is often poorly suited to the particulars of a certain problem. In contrast, voluntarily decreasing the size of human activity and relocalising it may give us the best chance of negotiating the challenges of the next decade or two.

The answer to most of the problems that will confront us will need to be found locally. This will be forced upon us by the realities of peak oil, but perhaps is worth doing anyway to allow the richness and compassion of true community living to infuse us all.

As it is impossible to predict with any certainty the exact techniques and materials that will be available in the future, this section will explore some of the general principles that might combine to form a sustainable and ethical health care system. After reviewing and contemplating many sources, these principles have mainly been based on the permaculture concept as developed by its co-originator, David Holmgren. He has been aware of the coming peak in global oil production for several years, and his book explicitly and extensively considers what he calls “energy descent”. We will also briefly examine the work of E. F. Schumacher, originator of the ideas of “intermediate size” and “intermediate (or appropriate) technology”².

Permaculture principles

David Holmgren has formulated twelve principles of permaculture. The first six look at the system from the bottom-up (the small details), while the second six look at it from the top-down (the big picture). He has also

² Schumacher EF. *Small is Beautiful: A study of economics as if people mattered*. First published in 1973.

incorporated system design and explicit ethical considerations into what is a holistic system ideal for our purposes. The twelve principles are:

- Observe and interact
- Catch and store energy
- Obtain a yield
- Apply self-regulation and accept feedback
- Use and value renewable resources and services
- Produce no waste
- Design from patterns to details
- Integrate rather than segregate
- Use small and slow solutions
- Use and value diversity
- Use edges and value the marginal
- Creatively use and respond to change

One of the many appeals of permaculture is that it overtly considers the ethical principles at work, and reflects them in the design process. Holmgren says that the embodied ethics are primarily based on land and nature stewardship.

Permaculture is about self-reliance and “sustainable consumption”, as Holmgren puts it. This idea involves a contraction of production and consumption back to human-sized levels (those needed for the survival of the individual). To achieve this, permaculture is formulated around the principles observable in natural ecosystems and sustainable pre-industrial societies (as demonstrated by their long-term stability and ethic of environmental stewardship).

Holmgren says that ethics are central in the development of a solution to peak oil. They ensure “long term cultural and even biological survival,” and are particularly important when the power within a society is large and focussed, because they act as a limiting or regulating mechanism. The three main permaculture ethics are:

- Care for the earth
- Care for people
- Fair share

Permaculture-inspired ideas for healthcare after peak oil

We will need to look at the big picture first, and not get lost in the details of a solution. The strategies used at each location will be different, and will likely need to be adapted to changes that occur over time (for example if there is a sudden influenza epidemic, severe drought, or other catastrophe).

As permaculture uses “self-maintaining systems”, the implication is that each individual will need to take more responsibility for their own body, and try to be as healthy as possible. There will need to be a change in focus from the treatment of disease to the promotion of wellness. This idea is derived from the principle of minimising waste, as it is wasteful to use scarce healthcare resources treating a preventable disease. The system will also need to allow for changes in illness patterns. On the one hand, people are likely to be much more active, eat less processed food and lose weight. On the other hand, accidents, musculoskeletal injuries and infectious diseases may be more prevalent. Note also that self-reliance is ethically good. Additionally, it will be important to enlist the whole community in achieving good health, and the current boundaries that separate medical workers from the general public will become blurred.

Sustainable healthcare systems will probably include plant-based treatments (based on the ability of plants to catch and store solar energy). Holmgren says that “herbal medicine might not provide a complete pharmacopoeia, but we can, to a very great extent, successfully treat many ailments with locally grown and processed botanical medicines.” While you may or may not agree with this assertion, it is the idea behind it that is important: that locally produced things can fix health problems.

The focus on diversity and small-scale and slow (or lower-tech) solutions is based on Schumacher’s work. It is a concept that supports relocalisation, and the judicious use of technology on an appropriate scale (perhaps using a microscope to check a urine specimen for infection). A negative implication of diversity is that solutions will need to be designed to resolve a variety of problems unique to each location. An example: Distribution patterns of mosquito-borne illnesses like dengue fever and malaria are likely to alter as climate change accelerates, possibly making them a major problem in one location but not another. The diversity principle also suggests that medical systems will need to be designed with built-in flexibility to handle emergencies and other unforeseen events.

Appropriate technology

Schumacher discussed his ideas in his book *Small is Beautiful: A study of economics as if people mattered*. He believed that “production from local resources for local needs is the most rational way of economic life.” Appropriate technology uses the minimum level of complexity required for the job at hand. It ideally can be made locally (or at the very least maintained and repaired there), is of low cost and requires little maintenance. For our discussion, appropriate technology should be

made from locally available, sustainable materials, and contain little or no oil derivatives. There are many examples of this technology related to healthcare; the main ones are in public health areas like sanitation and clean water provision. A final idea of Schumacher's is that the reduced efficiency arising from using appropriate technology necessitates more human labour to produce a given amount of goods. This ensures full employment (thereby occupying otherwise idle workers) and is theorised to promote health, beauty and permanence.

Summary

Following oil peaking, we can choose to allow our society to slide into anarchy (as has Zimbabwe, and to a lesser extent Russia). Or we can choose an ethically-based and ecocentric pathway leading to a compassionate, humane and richer society typified by clusters of small-scale, self-sufficient communities. The choice is ours.

Appendix 2: The Ethical Challenges of Healthcare and Peak Oil

An ethical conflict occurs whenever the rights of two or more people, or groups of people, come into conflict. Put another way, it occurs when everyone can't get what they want, and tough decisions need to be made about the allocation of scarce resources.

It is particularly likely that ethical dilemmas will arise during the redesign of the healthcare system as a response to peak oil. This is because there will be a conflict between what is best for society as a whole, versus what is best for the individual.

It is also likely that the quality of life, safety and material abundance that we currently enjoy will decline once oil becomes scarce and expensive. It is probable that the next few decades will be characterized by the scarcity of many things, necessitating the need for rationing of healthcare and other important services.

Why ethics?

We have included this section on ethics because:

- Reasoned and ethical action is a sign of a civilised society.
- Medical practice has always been informed and guided by ethics.
- Doctors have an ethical duty to patients that should be absolute, regardless of the society in which they practice, or the conditions in which they find themselves.

A physician has three main ethical duties to patients (beneficence, non-maleficence, and respect for autonomy) that should be inviolate, and which form the foundation upon which all further activity (including considerations of rationing) are built. Ethics must be considered in the Australian response to peak oil if we are to remain a just and compassionate society.

Healthcare rationing

Rationing presents peculiar ethical challenges, because the conflict between community and individual rights is brought into stark relief. And while the Australian health care system already has some rationing (in the form of the Pharmaceutical Benefits Scheme, public hospital waiting lists, and some item numbers in the Medicare system), it is likely that much tougher decisions will need to be made in the future. These decisions are likely to involve issues of life and death, such as who may have access to potentially life-saving treatment, and who may not.

The case of renal dialysis

Consider the example of renal dialysis (as it has been discussed extensively in the bioethical literature). It is a complex and expensive undertaking, and is already being rationed in New Zealand. They have introduced a strict and explicit system of rationing to determine who may have access to dialysis, and essentially who may die fairly quickly of end-stage renal failure. Their system relies on a set of clinical guidelines that were developed by a consensus process in the early 1990s, and considers age and the presence of significant co-morbidities. The intent was originally that no-one over the age of 75 years would be dialysed. The system has generated a large amount of controversy and public discussion, and has been tested in the courts at least twice.

Rationing inevitable regardless of peak oil

Even if oil peaking wasn't imminent, it is likely that the ethical dilemma of rationing would become increasingly important anyway. There are two reasons for this statement:

1. Australia's ageing population will need much more care as they get older, especially as the baby-boomers enter their seventies.
2. As medical technology continues to produce technological breakthroughs, the cost to access these treatments goes up. This is because "designer drugs" and "magic bullets" are becoming more common, but have such high development costs. As these sorts of treatments (termed pharmacogenomics) tend to be targeted at uncommon or rare conditions, the cost per patient is high so that research and development costs can be recovered. They also tend to be targeted at age-related diseases like cancer, so demand will increase significantly in the coming years.

It is clear then that sooner or later, countries like Australia will need to make tough decisions about health care rationing, which will result in serious illness or death for those that miss out. There is no way to dodge the magic bullets! The rights of the individual will always collide with the good of society, thereby producing ethical dilemmas.

Developing ethical decision-making frameworks

Coming resource scarcity, whatever the cause, is adequate motivation to develop an ethically-based framework that can guide fair and just decisions about resource allocation. Such a framework ensures that the decision-making process is transparent, and that it satisfies the ethical duties of honesty and disclosure. It also ensures that the concept of justice (in this case distributive justice) is incorporated by including a process of public consultation. An honestly conducted public enquiry satisfies the ethical duty of fairness, and should reduce conflict down the track by seeking consensus up-front.

Having explicit guidelines for clinical decision making is one of the two ways that healthcare rationing can be achieved. Explicit guidelines are prescriptive and relatively inflexible. The New Zealand experience shows that they may be open to legal challenge, or trigger widespread debate and dissent in a population. Even though the idea of such guidelines is attractive, there are several potential problems in addition to legality and public opinion:

- Fails to acknowledge that medicine is both art and science.
- Difficult to incorporate new information or clinical developments once treatment has started.
- Doesn't acknowledge clinically-relevant differences between patients.
- Relatively inflexible.
- Susceptible to outside influence (such as political or media pressure).

The other way of rationing scarce healthcare resources is through an implicit process. Such a system relies on the making of discretionary decisions within a fixed healthcare budget. Strategies include:

- Queuing (eg public hospital elective surgery waiting lists).
- Decreased service intensity (eg monthly therapy sessions instead of weekly ones).
- Substitution of less expensive services for more costly ones (eg generic medications).
- Excluding some treatments from the public system completely (eg weight loss medications and the PBS).

So while at first explicit guidelines seem more attractive, implicit rationing (within a given budget) seems better able to respond to the complex, diverse and rapidly-changing environment likely to occur after peak oil. It will also be more likely to have the speed and flexibility required to cope with rapidly changing events, and allows physicians to make exceptions to rules that seem unfair or unwise in specific instances.

Distributive justice

It is a moral imperative that rationing be fair and just. It is also a practical one both politically and socially (to maximise the chances of re-election, and reduce the risk of revolt, respectively). Inequality in the distribution of goods is evident when favouritism or discrimination occurs: the process is then said to be unfair or unjust.

According to Kjellstrand (1996), there are three theories of justice that are frequently applied to medical decision-making:

1. Egalitarianism – All people have intrinsic worth. Equal access to health care is a right. Need for services is the primary criterion to make decisions.
2. Utilitarianism – Values the good of the community over the good of the individual. Equality subordinated to overall outcome.
3. Libertarianism – Primacy of personal autonomy. No automatic right to healthcare. Healthcare is just another service for those who want and can afford it.

These three different views of the one ethical principle explain how conflict in resource allocation occurs. We need to recognise the difficulty, complexity and challenge of making decisions after oil peaking. We should favour processes that are as fair and honest as possible, but which retain their flexibility and are able to react to changing conditions quickly.

Values after peak oil

In the interests of stability and safety after peak oil (themselves utilitarian values), it is likely that the order of priority for the three theories listed above will be (1) utilitarianism; (2) egalitarianism; (3) libertarianism. This is because the good of the community will be of primary importance as our society adapts to changed and unstable conditions, and resource scarcity means that limited medical services must be allocated to maximise the greater good, and promote security and safety. For instance it is likely that workers and those with useful skills will receive treatment first, as the survival of the group will depend on the survival of the able-bodied and skilled. Although the order of the

other two approaches will depend on local factors, one would hope that compassion and charity might remain important.

A new land ethic

Different ethical viewpoints make distinctions between those entities that count in a moral consideration, and those that don't. At one extreme is the belief that only living humans with the capacity to think are worthy of moral consideration. This viewpoint excludes the foetus, unborn future generations, and the natural world from consideration.

At the other extreme are the viewpoints of deep ecology and the Gaia hypothesis, whereby all things are seen as being morally important and as having intrinsic net worth, and as deserving of being treated in an ethical manner. The current state of our environment serves as evidence that our globalised industrial society doesn't extend basic moral protection to the natural world, thereby allowing phenomena such as the clear-felling of old-growth forests, strip-mining and global warming.

In contrast, many indigenous peoples held their environment in high regard, often to the point of sacredness. This reverence for the natural world allowed indigenous cultures to develop sustainable societies.

In a scarce oil future, it is envisaged that many of us will live in much closer approximation to nature, spend a significant part of our time working the land using low-tech methods, and depend on the health of local ecosystems for our own health and survival.

Conclusion

Although this section is about medical ethics and rationing, it is worthwhile considering the type of ethical approach to nature that will be required to achieve long-term sustainability in a relocalised future. The "land ethic" of Aldo Leopold and the ethics of the permaculture system demand a respect for and partnership with nature that will be crucial to our survival. Both approaches acknowledge that natural things have intrinsic worth and moral standing. It logically follows then that they deserve to have the same ethics applied to them as we use for ourselves.

Once the place of nature in an ethical framework has been clarified, the preceding discussion on rationing can be used to determine the way that other goods (such as water, food, clothing, shelter and energy) are shared and distributed. Indigenous people used an oral tradition of stories, rules and taboos to disseminate their system of land stewardship (for example a prohibition on hunting female animals during breeding season, or the way that water holes were to be managed during a drought). Hopefully we can formulate a similar system of ethics that includes all of nature as

a moral being worthy of ethical consideration. Only in that way can we effectively deal with peak oil and energy descent.

Appendix 3: An introduction to the methodology of oil vulnerability analysis

Multi-level oil vulnerability risk assessment and reduction

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Assessing the impacts of Peak Oil at very detailed levels offers many major benefits. If Peak Oil is considered just at the level of an entire national economy most people, including decision-makers, will say "It is all too hard", as many have done with global warming. Most people and organisations are largely unaware of the numerous widely-varying opportunities open to them to reduce their oil vulnerability.

The impacts of Peak Oil will be felt very differently across various sectors of society, industry and commerce and between disparate geographic locations. Similarly, the opportunities which arise from future oil shortages will be many, but far from uniformly distributed.

Methodologies must be developed and tested for assessing oil vulnerabilities in a number of dimensions and levels. These will enable individuals and organisations to consider their Peak Oil impacts and to devise clever and unexpected ways to minimise them. Consultants should offer to prepare individual oil vulnerability audits and risk management plans. These must generally concentrate on behavioural and policy-level options which are where the greatest opportunities lie, rather than just on the normal but restricted technological strategies of more efficient vehicles and alternative fuels.

Examples: (a) Simple "oil vulnerability index" maps of major Australian cities have been published, showing in considerable detail areas where, on average, people will be more at risk from fuel price rises. (b) Hirsch et al. broadly modelled possible production levels of some alternative fuels

and the effects of improved motor vehicle efficiency. Much wide-ranging detailed work is needed to inform and empower people about all their mitigation and adaptation options (and their limitations). We need to demonstrate that effective Peak Oil strategies will be a composite mixture of many small steps. One or two strategies alone are highly unlikely even to come close to being adequate to ameliorate the impact of Peak Oil.

ASPO-Australia has created a number of separate working groups, each concentrating on different sectors. These include: Active Transport; Health Sector; Finance Sector; Social Services Sector; Urban and Transport Planning; Biofuels; Remote and Indigenous Communities; Defence and Security; Construction Industry; and Agriculture, Food and Fisheries. We made twelve detailed submissions to the Australian Senate Inquiry into Australia's future oil supplies (available on our website).

A major factor which so far has been largely overlooked is the proven 10-15% reduction in automobile use by many communities, on three continents, after low-cost individualised marketing programmes provided information on transport choices and empowered individuals to find alternatives for some of their automobile trips. The potential for further reducing automobile dependence in developed countries is very large indeed, using behavioural, taxation and planning policy options.

The health sector is one example which illustrates the need for a very detailed evaluation of the effects of Peak Oil. Some health costs will rise when fuel is scarce, for instance staff and patient travel to hospitals and clinics. However, Western community health levels overall may well improve substantially with less air pollution and many less road crash injuries. Increasing physical activity in transport (more walking, cycling and public transport, and less automobile dependence) will result in a substantial decline in the current epidemics of obesity and the many serious related health problems.

ASPO-Australia's main recommendations to the Senate concentrate solely on the behavioural aspects of oil vulnerability reduction as a first step, starting with community engagement. We recommend the creation of an Office of Oil Vulnerability by each national, regional and local government and by businesses and industry groups to start the process of a systematic evaluation of the likely impacts of Peak Oil and of the potential countermeasures, at every level.