Environmental Sustainability & Healthcare: What do Health Professionals Need to Know?

A/Prof Katherine Barraclough
Nephrologist, Royal Melbourne Hospital
Overarching aim

To impart that....

*Environmental sustainability is core business for health professionals,*

*and therefore....*

*It needs to be a core component of health education*
Outline

1. The relationship between the environment & human health
2. The impact of environmental change on human health
3. The impact of healthcare on the environment
4. Why is education of health professionals so important?
5. What is already happening in this space in Australia & NZ?
Environment & health – how are they linked?

Nature's goods and services = ultimate foundations of health & life

• Humans have a fundamental need for
  - Water
  - Food
  - Clean air
  - Shelter
  - Relative climatic constancy
Our environment is also responsible for...

- Nutrient & waste processing & detoxification
- Regulation of infectious diseases
- Recreational opportunities
- Mental, cultural, spiritual enrichment

“(The land) is our life. Without the land, we are nothing.”
Andrew Johnson, Aboriginal Elder, Lajamanu, NT

WHO. Millenium Ecosystem Assessment Report. 2005
Vital source of medicines

Cone snails

• Common on coral reefs & in tropical tidal zones
• Venom being developed as an alternative to opioids
• Particular promise in chronic neuropathic pain
• Potentially 100x stronger than morphine, fewer side effects and lower addictive potential

Prashanth et al. Future Med Chem. 2014
Nature has medicinal potential

Forest Bathing (*shinrin-yoku*)
- Reduces heart rate and BP
- Reduces cortisol levels, anxiety & depression
- Reduces BNP levels
- Attenuates inflammatory response
- Reduces markers of oxidative stress
- Improves immune function (increased NK cell activity)
- Reduced symptoms of ADHD

Nature has medicinal potential

Royal Children’s Hospital, Melbourne

- Set in parkland
- ‘Park in a hospital, & a hospital in a park’
- Building designed to reflect colours from surrounding trees & nature
- Almost constant access to natural, direct light
- Almost all rooms have view of outdoors
Our environment is changing at an unprecedented rate

The Anthropocene (anthropo = “man” & cene = “new”)  

Humans…  
• Live on every continent & have had direct impact on 83% of the earth’s surface¹  
• Are triggering the rapid loss of terrestrial & marine life²  
• On course to see more plastic than fish in the sea by 2050²  
• Have altered our oceans, the climate, the functioning of ecosystems, the geochemistry of the earth…³

¹ Sanderson. Bioscience 2002  
² World Economic Forum Report 2016  
³ UN IPCC 5th Assessment Report 2014
Climate change – a wicked problem

For 650,000 years, atmospheric CO₂ has never been above this line... until now.

Average global temperatures in February 2016 were 1.65°C warmer than the norm for 1880–1900 which is the baseline used by the IPCC.

Climate change & health

2009 Lancet-UCL Commission on Climate Change & Health¹
• “Climate change is the biggest global health threat of the 21st century”
• “Effects of climate change on health will affect most populations in the next decades & put the lives & wellbeing of billions of people at increased risk”

2015 Lancet-UCL Commission on Climate Change & Health²
• “The effects of CC are being felt today, & future projections represent an unacceptably high and potentially catastrophic risk to human health.”
• “Tackling climate change could be the greatest global health opportunity of the 21st century”

Climate change & health

Direct effects
- Heatwaves
- Extreme weather events
- Altered air quality

Indirect effects
- Altered infectious disease distribution
- Changes to crop yields and fish stocks
- Altered aeroallergens
- Changes to water quality and flows

Deferred & diffuse risks
- Displacement
- Conflict & social unrest
- Mental ill-health

Watts et al. Lancet 2015
Climate change & health

"Between 2030 & 2050, climate change is expected to cause ~250,000 additional deaths per year."

WHO 2014
Consequences greatest for poorest countries

- Even though they contribute the least to emissions
- Loss of healthy life years predicted to be 500 x greater in poor African vs. European populations

“The rich will find their world to be more expensive, inconvenient, uncomfortable, disrupted and colourless; in general, more unpleasant and unpredictable, perhaps greatly so. The poor will die.”

Climate change & health

“While the poorest and most vulnerable communities might suffer the most, the interconnected nature of climate systems, ecosystems & global societies means that none will be immune.”

Watts et al. Lancet 2015
Climate change & health in Australia

**Bushfires**
- 2009 – Victoria
  - 173 deaths
  - 414 public ED presentations
  - Increased out of hospital cardiac arrests & CV mortality
  - Ongoing mental health impacts 4 years after event

**Heatwaves**
- 2009 - Victoria
  - 374 excess deaths
  - 46% ↑ in ambulance call-outs over hottest 3 days
  - 8-fold ↑ in ED presentations
  - 2.8-fold ↑ in cardiac arrests

**Floods**
- 2011 - Queensland
  - 33 deaths, 3 people still missing
  - Reduced overall health and wellbeing in those affected
  - 2x risk of psychological symptoms including PTSD

CSIRO 2016 & 2017
Doctors for the Environment Australia. www.dea.org.au
We should expect...

• Longer, hotter, more frequent heatwaves \(^1,2\)
• An increase in severe fire danger days & longer fire season \(^1,3\)
• More heavy rainfall days, extreme rainfall events & severe flooding \(^4\)

1. CSIRO 2016
2. Bureau of Meteorology 2016
3. UN Intergovermental Panel on Climate Change 2014
4. CSIRO 2015
Allergies & asthma

• ~1 in 5 Australians has an allergic disease ¹,²
• 1 in 10 suffers from asthma ¹,³
• ↑ temperatures & atmospheric CO₂ can ↑ production, potency & release of pollens & spores ¹,⁴,⁵
• Changes to wind & rainfall patterns due to climate change may also affect allergen production & distribution ¹

2. ASCIA 2013
3. AIHW 2011
4. Beggs et al. Env Health Perspectives. 2005
Thunderstorm asthma

Melbourne, Nov 21, 2016

• “One ambulance call every four-and-a-half seconds at the peak — it was like having 150 bombs going off right across a particular part of metropolitan Melbourne” ¹

• Emergency departments overwhelmed

• ~8,500 hospitalised, 10 deaths ²

European Respiratory Society Position Statement

• “It is likely that, with climate change, there will be an increase in thunder-storms, which are known to be associated with outbreaks of asthma mediated through allergen exposure, notably pollens and wet-air fungal spora” ³

1. Victorian Minsiter of Health, Jill Hennessey
2. Thien et al. Lancet Planet Health 2018
All organ systems affected

More acute kidney injury
- During heatwaves
- From vector-borne diseases
- From water-borne diseases

More chronic kidney disease
- Epidemics of “heat stress nephropathy”

More nephrolithiasis
- ↑ ambient temperature = major risk factor

Extreme weather events → destabilising impact on provision of dialysis

Barraclough et al. Kidney International 2017
All organ systems affected
All organ systems affected
Climate change and human infectious diseases: A synthesis of research findings from global and spatio-temporal perspectives

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b Department of Environmental Science, Policy, and Management, University of California, Berkeley, CA, USA
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Climate Change
A Global Threat to Cardiopulmonary Health

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All organ systems affected

Climate change and mental health: risks, impacts and priority actions
Katie Hayes, G. Blashki, J. Wiseman, S. Burke and L. Reifels

Abstract
Background: This article provides an overview of the current and projected climate change risks and impacts to mental health and provides recommendations for priority actions to address the mental health consequences of climate change.

Discussion and conclusion: The authors argue the following three points: firstly, while attribution of mental health risks stems from the rapid increase in atmospheric concentrations of carbon dioxide that determines the climate, with substantial implications for human health.
Climate Change and Mental Health Systems

Climate change and mental health: risks, impacts and priority actions
Katie Hayes, G. Blashki, J. Wiseman, S. Burke

Abstract
Background: This article provides an overview of the mental health and provides recommendations for prioritizing climate change.
Discussion and conclusion: The authors argue the risks abrupt and irreversible consequences for mental health for mental health communities and ecosystems. One planetary boundary that is being rapidly approached is the atmospheric concentration of carbon dioxide that determines our climate, with substantial implications for human health.

Climate Change and Skin Disease
Ashley D. Lundgren, MD
Climate change is ALSO a health opportunity

2015 Lancet Commission on Climate Change & Health¹

• “Tackling climate change could be the greatest global health opportunity of the 21st century”

• Acting to reduce GHG emissions

  Protects against direct and indirect health impacts of climate change
  
  Can also benefit health through mechanisms quite independent of climate
  
  = “Health co-benefits” of climate change mitigation

Energy sector

Fossil fuels responsible for > 75% of global GHG emissions\(^1\)

A transition to “clean” energy will address the
• Health impacts of climate change
• Health impacts of air pollution \((\text{kills 7 million annually})^2\)

This will...
• Prevent illness
• Save lives

We need to measure & promote co-benefits

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1. NZ Environmental Reporting Series. 2018
2. Patz et al. JAMA 2014
Transport sector

- Transport industry responsible for **25%** global GHG emissions
- Physical inactivity may be responsible for **3.2 million deaths** annually

<table>
<thead>
<tr>
<th>Country</th>
<th>Intervention</th>
<th>Health Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe &amp; Asia</td>
<td>Active commuting</td>
<td>11% ↓ CV risk</td>
</tr>
<tr>
<td>U. S.</td>
<td>Bike transport</td>
<td>20% ↓ obesity 23% ↓ diabetes</td>
</tr>
<tr>
<td>China</td>
<td>Active commuting</td>
<td>48%-44% ↓ colon Ca</td>
</tr>
<tr>
<td>Denmark</td>
<td>Commuter cycling</td>
<td>39% ↓ mortality</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Shifting 5% vehicle transport to cycling</td>
<td>Avoidance of 122 deaths annually</td>
</tr>
</tbody>
</table>
Agricultural sector

Agriculture & forestry contributes 24% to global GHG emissions\(^1\)

If consumption of meat, dairy & eggs were halved

GHG emissions could be reduced by 25-40%
Saturated fat intake could be reduced by 40%\(^1\)

Expected to impact risks of...

- Obesity
- Heart Disease
- Diabetes
- Some cancers (e.g. bowel Ca)

Transitioning to a more plant-based diet could reduce global mortality by 6–10%\(^2\)

1. Patz et al. JAMA 2014
The economics...

• Concern exists re the costs of climate change mitigation
• Most existing analyses fail to consider averted health costs

Monetized health benefits from air quality improvements are estimated to offset the cost of US carbon policies by 25%-1050%²

If active travel in England and Wales could reach the level seen in Copenhagen, costs averted for the NHS would approximate UK £17 billion over a 20-year period³

The environmental impact of healthcare

**Contribution to national carbon footprint**

**United States:** 10%

**United Kingdom:** 4%

**Australia:** 7%

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**The carbon footprint of Australian health care**

Arunima Malik, Alexander Laurence, Scott McAlister, Forbes McGar

**Summary**

**Background** Carbon footprints stemming from health care have been found to be variable, from 3% of the total national CO₂ equivalent (CO₂e) emissions in England to 10% of the national CO₂e emissions in the USA. We aimed to measure the carbon footprint of Australia’s health-care system.

**Methods** We did an observational economic input-output life-cycle assessment of Australia’s health-care system. All expenditure data were obtained from the 35 sectors of the Australian Institute of Health and Welfare for the financial year 2014-15. The Australian Industrial Emission Virtual Laboratory (AIE Lab) data were used to obtain CO₂e emissions per AUS$ spent on health care.

**Findings** In 2014-15 Australia spent $661.4 billion on health care that led to CO₂e emissions of about 35,772 (68% from 25,398-46,146) kilotonnes. Australia’s total CO₂e emissions in 2014-15 were 494,939 kilotonnes. Thus health care represented 35.77% (7% of 494,939 kilotonnes) total CO₂e emissions in Australia. The five most important sectors within health care in decreasing order of total CO₂e emissions were: public hospitals (12,295 [54%] of 35,772 kilotonnes CO₂e), private hospitals (3,633 kilotonnes [10%]), other medications (3,47 kilotonnes [9%]), benefit-paid drugs (2,37 kilotonnes [9%]), and capital expenditure for buildings (277 kilotonnes [8%]).

**Interpretation** The carbon footprint attributed to health care was 7% of Australia’s total with hospitals and pharmaceuticals the major contributors. We quantified Australian carbon footprint attributed to health care and identified health-care sectors that could be ameliorated. Our results suggest the need for carbon-efficient procedures, including greater public health measures, to lessen the impact of health-care services on the environment.

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1. Malik et al. Lancet Planetary Health 2018
The environmental impact of healthcare

• Our primary professional mandate...“First, do no harm”¹

• “Healthcare has a responsibility to get its own house in order to avoid the paradox of doing harm while seeking to do good”²

1. Hippocrates
2. Godlee, BMJ 2014
The environmental impact of healthcare

The paradox...

• For a particular US healthcare facility, direct expenses associated with emissions totalled $2.4 million annually, while indirect societal costs for premature deaths, chronic bronchitis, asthma & more totalled $23 million\(^1\)\(^2\)

• Harmful effects on public health from the US health care sector’s direct and indirect pollution emissions estimated at 405,000 to 470,000 DALYs\(^1\)\(^3\)

• An GHG emission reduction target of 30% rather than 20% from 1990 levels by 2020 in the EU would produce health savings from concurrent decreases in fossil fuel derived air pollutants of between €10.5-€30.5 billion per year\(^1\)\(^4\)

2. Healthcare Without Harm. [https://noharm.org](https://noharm.org)
Clinical decisions in day to day practice

Anaesthetic gases

• Significant & sustained environmental impact
  • Some more than others

• Environmental impact can be ↓ by clinicians
  • Utilising low-flow anaesthesia
  • Using agents with lower environmental impact
  • ↑ use of regional or total IV anaesthesia

• Western Health (Victoria)
  • Anaesthetists switched from desflurane to sevoflurane
  • Yearly savings of ~ $30,000 and 140 tCO₂ emissions

1. ANZCA Statement on Environmental Sustainability; available at www.anzca.edu.au
Clinical decisions in day to day practice

Drainage of APD effluent

Three methods available

1. Drain into plastic drain bag → bin
2. Use drain line to drain directly into a sink/shower
3. Drain into 25L plastic drum with a tap → empty into shower/sink
Clinical decisions in day to day practice

<table>
<thead>
<tr>
<th>Drain Option</th>
<th>Total waste weight/month</th>
<th>Cost/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baxter Drain Bag</td>
<td>6 kg</td>
<td>$401.30</td>
</tr>
<tr>
<td>Baxter High Dose Using Drain Bag</td>
<td>12.6 kg</td>
<td>$936.30</td>
</tr>
<tr>
<td>Fresenius Drain Bag</td>
<td>9 Kg</td>
<td>$420.00</td>
</tr>
<tr>
<td>Baxter Drain Line (3.65m)</td>
<td>2.5 kg</td>
<td>$59.70</td>
</tr>
<tr>
<td>Fresenius Drain Line (12.3m)</td>
<td>9.75 kg</td>
<td>$150.00</td>
</tr>
<tr>
<td>Reusable Drum</td>
<td>Nil (1.2 kg when drum no longer required)</td>
<td>1 off cost of $30-$40</td>
</tr>
</tbody>
</table>
Models of care

**Telehealth**
- Offered to RMH kidney transplant recipients since 2016
- 230 reviews (45 patients) to date
- Savings of:
  - **189,005 km** (4.7 trips around the world)
  - **57.6 tCO2 equivalents** (1229 seedling trees grown for 10 yrs)
- Patient feedback universally positive
- No-one has opted to return to in-person reviews
- No patient safety issues observed

Andrews et al. Abstract accepted for presentation ANZSN ASM Sep 2018
Models of care

One patient’s story

- set alarm for 4.30 am
- arrive at airport at 5.30
- catch morning flight at 6.30
- arrive in Melbourne at 7.50
- taxi in peak hour to RMH by 9
- wait in O/P until seen by clinician for 20 min
- fills in time until taxi back to airport for 1545 flight
- arrive Mildura at 1655
- home approximately 1730

Av cost $500

= 12+ hours of time for a 20 minute specialist consultation
The environmental impact of healthcare

Contribution to CFP of healthcare

- 43% Hospitals
- 4% General practice
- 6% Public health

“The role of public health in preventing hospital admissions in the first place will be crucial in a carbon-constrained healthcare system.”
The environmental impact of healthcare

There is a need for **structural changes** to our health system

- Illnesses that produce largest disease burden are **largely preventable**
- **YET**, we currently allocate **less than 2%** of overall health budget to **public health**\(^1,2\)

Clear evidence that a strong **primary health care orientation** is associated with\(^1\)

- ↓ costs
- ↑ efficiency
- ↓ rates of potentially preventable hospitalisations
- better population health outcomes\(^2\)

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2. Jackson H, Shiell A. *How much does Australia spend and is it enough?*
   Canberra: Foundation for Alcohol Research and Education. 2017
The environmental impact of healthcare

"A strong & readily accessible primary health care system is ... vital in reducing pressure on public hospitals through access to advice & services in the early stages of disease & a broader geographic distribution of suitably skilled health professionals compared to the concentration of specialists in urban areas"¹

¹ Doctors for the Environment Australia. www.dea.org.au
The impact of the environment on healthcare

→ Environmental change impacts health
→ This impacts healthcare

This adds to an already stressed healthcare system

• We have an aging population
• Burden of NCDs is rapidly growing
• Medical technology continues to advance
• Climate change will increasingly threaten health & wellbeing

“The future of expanding, high quality health care relies on it being delivered in ways that are both financially and environmentally sustainable.”

Education of health professionals

Why is this so important?

- Workforce preparedness
- Health system adaptation
- Advocacy
Workforce preparedness

Tomorrow’s health professionals need to...

- Be familiar with regional climate-health risks
- Be able to identify vulnerable patients
- Engage in health promotion & screening
- Address risk factors
- Diagnose & manage climate-related mental & physical illness
Healthcare sustainability

→ Healthcare is part of the problem

→ Health professionals need to contribute to solutions

We must consider...

• The impact of our day to day practice
• Opportunities for innovative, more sustainable models of care
We have a long (and proud) history of taking action against health threats
Advocacy

We are a powerful voice

• We are trusted and respected
• Health puts a human face to an abstract concept
• Health concerns attract political & public attention

“The health & well-being of our families, communities and countries... These concepts are far more tangible & visceral than tonnes of atmospheric C02, & and are understood and prioritized across all populations irrespective of culture or development status.”

We have an obligation

We must speak out for the health of those with less of a voice

• More vulnerable populations
• Future generations

Climate change also raises the issue of intergenerational justice. The inequality of climate change - with the rich causing most of the problem & the poor initially suffering most of the consequences - will be source of historical shame to our generation if nothing is done to address it.”

Advocacy

We are faced with an opportunity

- Appropriate action will bring substantial benefits to human health

“In our hand is the substantial health dividend of more active, sustainable lower carbon lifestyles: lower rates of obesity, heart disease, diabetes & cancer.”

What is already happening?

The need for health professional education is well recognized

Called for “mainstreaming climate change & health topics into medical and public health training.” ¹

Encouraged “educational institutions and educators to integrate (education on climate change challenges and solutions) in their teaching activities from the pre-school to university levels.” ²

¹ World Health Organization
² UNESCO. Declaration of Ethical Principles in Relation to Climate Change, 2017
What is already happening?

**Australian Medical Students Association**
- E-course with 4 modules
  - Climate change
  - Health effects
  - Impact on vulnerable populations
  - Advocacy for change

**International Federation of Medical Students Associations**
- Training manual for students & young professionals full of information, resources, tools, ideas
What is already happening?

3 position statements
- Climate Change & Health
- Environmentally Sustainable Healthcare
- Health Benefits of Mitigating Climate Change

Position Statement on Environmental Sustainability in Anaesthesia and Pain Medicine Practice
What is already happening?

Medical Deans of Australia & NZ

- Membership = Deans of 18 Australian & 2 NZ medical schools
- Recognised the need for medical school collaboration
- In 2016, formed a Climate Change & Health Working Group

Madden et al. Med J Aust 2018
What is already happening?

Many good things

- But, we have come to this late
- Our response must be expanded and accelerated
- There is just one planet capable of supporting us
- We all have a responsibility & an opportunity
- Health professionals have critical role to play
Conclusions

• Human health relies on a healthy planet
• Anthropogenic environmental change threatens human health in unprecedented ways
• Healthcare itself contributes to the problem

• We need to educate healthcare workers so they
  • Are prepared
  • Can address the impact of their own practice
  • Can advocate for change
“Saving our planet, lifting people out of poverty, improving health...these are one and the same fight. We must connect the dots between climate change, water and energy use, food security, empowering women and global health. Solutions to one problem must be solutions for all.”

- Ban Ki-Moon, Secretary General, United Nations
CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.
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www.dea.org.au

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