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## Less can be much more than you think :

# When smarter and greener medicine meet to create an eco-top 5 list

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**Introduction :** The health system has a significant environmental impact, constituting 5-10% of greenhouse gas emissions. 25-33% of them can be attributed to drugs. In addition to their impact on climate change, drugs and therapies also play a role in causing biodiversity loss and bacterial multiresistance, which are also among the major threats to humanity in the 21st century.

**Choosing Wisely (CW) recommendations have identified several large categories of drugs that may cause more harm than benefits to patients. CW campaigns can lead to environmental co-benefits.**

So far, published data combining the principles of CW campaign and environmental health are scarce. We thus chose to conduct a practical scoping review focusing on the dual impact, both clinical and environmental, associated with certain drug categories.

**Methods :** A working group (i.e. authors) gathered the primary drug categories featured in the top five lists associated with the Smarter Medicine CW Switzerland campaign for general internal medicine. These drugs and therapies are identified as having low added clinical value in specific clinical settings. We performed a pragmatic review of the main ecotoxicological data about these drugs by using the following MeSH terms on Pubmed and Google Scholar: *ecotoxicology (or) environment (or) climate AND the name of each specific drug or category of drugs (see QR code)*. We categorized each depending on their level of environmental harm and listed an **eco-top 5 list of drugs/substances** of common use, with a low clinical value and a high environmental impact.

**Results :** Through a validation process among the working group, we identified the following classes of drugs that raise environmental concerns and offer no or low added value. We listed how they can be readily substituted with effective alternatives (**see Table**).

**Table : Description of clinical and environmental and daily potential solutions for medical practice of an eco – top 5 list**

Drug class	Choosing wisely recommendations	Clinical harms	Environmental harms	Combined recommendations
<b>Inhaled bronchodilators and corticosteroids</b>	No prescription of inhaled drugs without objective evidence of COPD or asthma	Low adherence, exacerbation or recurrence	<ul style="list-style-type: none"> <li>Direct emission of very potent greenhouse gases</li> </ul>	<ul style="list-style-type: none"> <li>Prescription of dry powder if no contraindication</li> </ul>
<b>Antibiotics</b>	No antibiotics for uncomplicated upper respiratory tract infections	Drug-drug interactions and side effects	<ul style="list-style-type: none"> <li>Presence of antibiotics in rivers and lakes</li> <li>Probable impact on biodiversity and drinking water quality (important differences between antibiotics classes)</li> <li>Emergence of antimicrobial resistance</li> </ul>	<ul style="list-style-type: none"> <li>Consider using targeted blood and microbiological tests</li> <li>Comply with the guidelines of the Swiss Society of Infectiology to lower use and duration.</li> </ul>
<b>Iodinated contrast media</b>	No imaging for low pretest probability of pulmonary embolism and for low back pain	Side effects, such acute renal impairment, allergy	<ul style="list-style-type: none"> <li>Presence of iodinated contrast media and gadolinium in rivers and lakes</li> <li>Possible impact on biodiversity and drinking water quality</li> </ul>	<ul style="list-style-type: none"> <li>Respect strict indications for imaging; collect urines after contrast media use</li> <li>Improve hospital and city water plant treatment</li> </ul>
<b>NSAIDs</b>	No NSAIDs in individuals with hypertension, heart failure, chronic kidney disease or older people	Side effects (acute renal impairment, peptic ulcer, allergy)	<ul style="list-style-type: none"> <li>Presence of NSAIDs in rivers and lakes</li> <li>Impact on fauna (renal failure), biodiversity and drinking water quality</li> <li>Important differences between NSAID's classes</li> </ul>	<ul style="list-style-type: none"> <li>Prefer acetaminophen (paracetamol) and non-pharmacological treatments.</li> <li>Teach pharmacists about environmental impacts of different NSAID's classes and ecoresponsible prescription.</li> </ul>
<b>Antidepressants</b>	No antidepressants as first-line treatment for moderate depression in teenagers, mild depression in adults or comorbid alcohol use disorder.	Drug-drug interactions	<ul style="list-style-type: none"> <li>Antidepressants in rivers and lakes</li> <li>Possible impact on biodiversity and drinking water quality</li> </ul>	<ul style="list-style-type: none"> <li>Prefer non-pharmacological options</li> </ul>

**Conclusion :** Implementing CW recommendations may impact individual patients' quality of care by decreasing drug interactions and side effects, and also decreases planetary harm. To achieve this, it is imperative to shift away from siloed thinking and embrace collaborative models that consider not only effectiveness but also the human, social, environmental, and economic costs associated with drugs. Integrating CW Smarter Medicine and environmental health serves as a paradigm for such a model.