**Worksheet 1 Asthma (Facilitator version 1.0) – Studying the system: environmental impacts**

**Background information for Facilitators**

When thinking about the environmental impact of any healthcare intervention, there are several broad categories to consider.

**Carbon footprint**: this refers to the amount of greenhouse gases (GHG) emitted directly or indirectly attributable to a process, product or organisation usually expressed in kg CO2 equivalents. Elements of healthcare activity with a measurable carbon footprint include:

* Energy use on site (burning fuel for heating, electricity use for lighting, cooking and cleaning etc)
* Release of anaesthetic gases / nitrous oxide
* Travel (staff, patients, carers)
* Pharmaceuticals and medical equipment (supply chain emissions – from manufacture and distribution)
* Non-medical equipment and supplies (supply chain emissions for furniture, IT equipment, laundry, etc.)
* Food production
* Waste disposal

**Non-carbon impacts:** A Carbon footprint is an important measure of environmental impact, but it is not the only one. Consider whether any of the following environmental impact categories apply to the Quality Improvement project, too:

* **Air pollution:** non-carbon pollutants from fossil fuel use or waste incineration (nitrogen oxides, particulate matter)
* **Deforestation, landscape degradation, loss of biodiversity** (mining and plantations for supply chains)
* **Depletion of scarce natural resources**, including fresh water
* **Bio-accumulation and toxicity** of chemicals entering the environment, often through water pollution (antibiotics, antidepressants, contraceptives, propofol)
* **Plastic pollution** from inadequate waste disposal systems / littering

**Activity 1 – Study the system for environmental impacts**

**Task A: Read the scenario below and look at the process map. What environmental resources do you think are currently being used in this scenario? Can you identify the resource which is a carbon hotspot?**

Consider the environmental impacts/resources used at each step of the process map and write your answers in table 1 column 2 below. Once you have completed your list of resources, identify which one you think is the carbon hotspot (i.e.. the resource with the most intense concentration of GreenHouse Gas (GHG) Carbon emissions). Please appoint a scribe in your group and someone to feedback your answers ready for when you return to the whole group.

 **Task B: What data could be collected to measure the resources you have identified?** Think how you could measure the total amount of resources you have identified. Write your answer in table 1 column 3.

***Facilitator note****: Encourage students to think about each step of the process map and fill out table 1 (They may not get time to think of all the examples in the time allocated to the activity). The main aim is that they consider each area in the resource table so they begin to develop a skill of spotting carbon hotspots (in this case the pMDI) and a holistic sustainability lens when studying the system before designing the improvement. This exercise is also designed to encourage students to think about where they could find out and measure the data in order to measure the improvement later on in the Quality Improvement Project (QIP) process.*

**Scenario**

Ali is 13 years old. He is admitted to hospital via ambulance with breathlessness and wheeze. He is treated in ED for a severe acute exacerbation of asthma. He has a medical history of asthma and has been admitted to hospital 3 times in the last year. He is treated with nebulised salbutamol and steroids in the Emergency Department and admitted to the Paediatric Inpatient Unit.

Ali is discharged after 4 days and is encouraged to continue taking his regular medications. On speaking with Ali, he tells the team that he often forgets to take his preventer inhaler, particularly during the week when he is busy with school. He is prescribed a new Ventolin inhaler and given his Asthma Plan for managing exacerbations.

Ali lives at home with his family in the centre of town near the ring road in a ground floor flat, and walks to school along a busy road.

You discuss the case with your team who tell you of many similar teenage patients who are regularly re-admitted with exacerbations of asthma in your area.

You decide to do an audit with your ward clerk to find out more about this problem. You discover that 200 asthma patients are admitted at least 4 times per year, with an average length of stay of 4 days. They are usually brought to the hospital by ambulance and go home by taxi or private vehicle after discharge. You also notice that 80% are prescribed a new Ventolin MDI inhaler on discharge, 25% report poor adherence to their asthma plans and 30% live within a mile of the local ring road.

***Facilitator Note:*** *The purpose of this scenario is to encourage students to think about what might be the best solutions to this complex problem of frequently re-admitted adolescent patients with exacerbations of asthma. The assumption is that they are receiving optimal medical therapy and therefore reviewing their medical management plan is not the sole solution. Learners might think about adding in alternative therapy such as Monteleukast or regular oral steroids-we are assuming the patients have been medically optimised as per current NICE guidance. Instead, this scenario gets learners to think about avoidable and preventable hospital admissions, or ways in which the pathway could be adapted to better suit these patients. The focus should be on how we help patients like Alito better manage their illness to avoid a cycle of re-admissions with relatively little clinical benefit.*

*This scenario could equally be adapted to other chronic illness which cause cycles of readmissions in your area of work*



Table 1. Resource use

|  |  |  |
| --- | --- | --- |
| **Activity/Resource** | **Task A: What resources are currently being used?**  | **Task B: What data is available/ could be collected?** |
| 1. **Medical supplies**
 |  |  |
| **Medications** | Salbutamol nebulisers, oral steroids, antibiotics, oxygen. (additional regular medication prescribed which hasn’t been brought in with the patient) | Pharmacy department |
| **Anaesthetic gases / nitrous oxide** | N/A |  |
| **Propellant (MDI) inhalers** | Metered Dose Inhaler- Ventolin (Carbon hotspot-GHG), | Pharmacy department |
| **Medical & surgical equipment** | Venturi valve/ O2 mask, O2 tubing, Nebuliser kit (Vaporizer Medicine Cup and mouthpiece). [NB: can encourage students to think whether equipment used by the ambulance crew & ED might be duplicated and/or not compatible which will increase resource usage e.g.ECG electrodes]Staff PPE – Single-use masks, gloves, single-use plastic aprons, face shield/visors.Covid19 tests, MRSA swabs. Venepuncture and cannulation kit – (blood bottles, vacutainers and needles – cannula, bionector, sterile saline, gauze, antimicrobial skin prep wipes (e.g. Clinell wipes), surgical tape (e.g. micropore).  | Procurement department, Pathology department.  |
| **Dressings** | Cannular dressing (e.g.Tegaderm).  | Procurement department |
| **Diagnostic imaging & radiotherapy equipment & services** | ?Chest x-ray | Medical notes/coding |
| **Other, specify…** |  |  |
| 1. **Non-medical supplies**
 |  |  |
| **Office equipment, telecomms, computers & stationery** | Paper medical notes/care plans, computers.  | Health records department (sometimes known as medical records department)/IT department |
| **Furniture fittings** | Hospital beds, chairs,  | Procurement department |
| **Provisions** | Food and drink | Catering department |
| **Other, specify …** | Bed linen, hospital gowns, toothbrushes, toothpaste, hairbrushes, single-use disposable razors, washing supplies (wipes, soap, shampoo),  | Laundry services, procurement.  |
| 1. **Travel**
 |  |  |
| **Staff travel** | Ambulance staff, hospital MDT staff.  |  |
| **Patient and carer travel** | Ambulance journeys, family/friends (visitors) travel, taxi |  |
| 1. **Energy use**
 | Building energy – electricity, lighting, heating. | Estates department |
| 1. **Water use**
 | Drinking WaterWashingLaundry | Estates department, Laundry Services department.  |
| 1. **Waste disposal**
 | Clinical waste Non-Clinical wasteGrey-water waste (bath, shower, sink and washing water) Sewerage | Estates department |
| 1. **Units of healthcare activity**
 |  |  |
| **Inpatient bed-day** | 4 Inpatient bed-days per 10% of 1000 patients admitted last 6 months  | Bed manager |
| **Outpatient appointment** | unknown |  |
| **GP appointment** | 4 GP follow-up appointments in 10% of 1000 patients  | Secondary care data/ Primary care/CCG data.  |
| **Surgical or other procedure** | unknown |  |
|  |  |  |

**Activity 2 – Carbon footprinting in healthcare**

**Task**: **Using table 2. plus the equation and carbon emission factors below, in your groups try to work out the Carbon footprint of the following:**

* **200 patients attend the Emergency Department via Ambulance 4 times a year**
* **200 patients being admitted to hospital for 4 days, 4 times a year**
* **160 patients receiving 1 new Ventolin inhaler 4 times a year.**
* **200 patients discharged home via taxi*****(or private vehicle****)* **4 times a year**

**Carbon footprint (kg CO2e) = Activity/resource use x GHG emissions factors**

Table 2.

|  |  |  |
| --- | --- | --- |
| **Activity/Resource use** | **Carbon Emissions Factor** | **Activity/Resource x Emissions factor (kgCO2e)** |
| **Ambulance journey** | 36.1 kgCO2e / single trip |  *200 x 4 x 36.1 kgCO2e = 28,880* |
| **ED visit** | 13.8 kgCO2e / per visit |  *200 x 4 x 13.8 kgCO2e = 11,040* |
| **Inpatient bed day** | 37.9 kgCO2e / bed day |  *200 x 4 x 4 x 37.9 kgCO2e = 121,280* |
| **Ventolin inhaler**  | 28 kgCO2e/ visit  | *200 x 0.8 x 4 x 28 kgCO2e = 17,920* |
| **Travel home (taxi)** | 6.3 kgCO2e/return trip | *200 x 4 x 6.3 kgCO2e = 5,040*  |
|  | Total carbon footprint (kgCO2e): |  ***= 184,160 kgCO2***  |

**Facilitator note:** *This activity shows one way to calculate a carbon footprint using the carbon emission factor for units of healthcare activity e.g. one inpatient appointment for 200 patients.*

*The non-carbon method: A quick and simple way of measuring the environmental impact without doing a carbon footprint is to make a list of all the resources currently used and measuring/recording the amount used (before implementing an improvement idea) and then list and measure them again after implementing the improvement to compare if the resource use has increased or decreased. If it has decreased then the environmental impact has been reduced.*

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