APPENDIX

A Comparison of literature

Paper	Preventebale drugwaste among anesthesia providers: opportunities for efficiency 2015	Drug use inefficiency: a hidden source of wasted health care dollar 2000	Evaluation of drug wastage in the OR and IC of RHS May 2021	The wasatge and economic effects of anesthethic drugs 2019	Drug wastage contributes significantly to the cost of routine anesthesia care 2001
Study period	1 year: every day the first case In total 543 cases 1 single academic medical centre OR	1 year: 25481 patients A large tertiary care hospital OR	1 month 12 hospitals in the north of Italy which belong to the same Regional Health Service (RHS) OR and ICU	6 week period 363 cases OR Turkey A university hospital OR	2 weeks 166 cases California
Definition of drug waste	<u>Preventable drug waste</u>: an instance where a drug was drawn up in the OR for use during a surgical case but was not used during the case. <u>Routine anesthetic drug waste</u>: the amount of drug left over after the anesthesia provided has administered the required dose to the patient.	The appropriate or inappropriate disposal of unused or partially used ampoules, vials, or syringes of drugs.	Drug wastage: drugs prepared in ready to use syringes but not administered at all and discarded untouched **NO incompletely used syringes or vials were included**	Full and unused drugs **NO incompletely used syringes or vials were included**	all opened and unused or IV anesthesia drugs left over at the end of each workday **NO incompletely used syringes or vials were included**
Drugs measured	Glycopyrrolate Atropine Ephidrine Phenylephidrine Ondansetron	6 drugs: thiopental, succinycholine, rocuronium,	11 drugs tracked: atropine, cisatracurium, ephedrine, epinephrine, propofol,	All drugs	All drugs

	Dexamethason Lidocaine Rocuronium Vecoronium Succinylcholine Propofol was excluded because the use and wastage have been well studied elsewhere	atracurium, midozalam, propfol	lignocaine, midazolam, normal saline, phenylephrine, propofol, rocoronium, urapidil		
Tracked how?	The type and quantity of clean drugs prepared by the anaesthesia team were recorded. The amount of each drug administered was obtained from the computerized anaesthesia record. Registration system SAS software v9.2	Amounts administered to patients were collected for one year by using computerized anaesthesia record keeper. The total drug distributed was the number of vials restocked by pharmacy for a year. An efficiency index, the percent administered to patients, was calculated for each drug.	Each nurse was provided a data sheet on which to report the number of selected drugs prepared, used, or discarded during their shift.	At the end of each operation and operation day, the amount of wasted and consumables were recorded. The total wastage was calculated by multiplying unit prices.	All opened and unused or unusable IV anesthia drugs left over at the end of an workday were collected over an random 2 week period of time
Money	$185.250 cost for preventable aesthetic drug waste 1 year Only medication that went completely unused. Cost of syringes included + pharmacy techlabor + materials	$165,667 1 year Most dollars: $80.863 Propofol $32.839 Thiopental	€78.060($92.569) a year 4968 kg a year 1512 working hours Cost estimation was based on: AIP, cost	2545.77 TL total in 6 weeks: consumables + drugs 1304.55 TL drugs in 6 weeks Highest cost:	$1802 for 2 weeks 6 drugs 3 quarters of the waste: Phenylephrine (20.8%) Propofol (14,5%) Vecoronium (12.2%) Midazolam (11.4%)

	Cost per day: for 190 cases a day		related devices (syringes, caps, label, saline vials), + cost of medical waste disposal	Rocuronium (29.95%) Propofol (27.99%)	Labetalol (9.1%) Ephidrine (8.6%)
No. (%) of cases creating preventable waste	Most: Ephedrine (60%)	thiopental, 31% succinylcholine 33% rocuronium, 61% atracurium, 29% midozalam, 53% propfol 49%	Data concerning drug preparation and administration were collected.		
Most wasted drugs (percentage of total waste)			1. Epinephrine 2. Atropine 3. Ephedrine 4. Midazolam Normal saline	1. Thiopental (24.6) 2. Lidocaine (20.6) 3. Atropine (12.1) 4. Rocuronium (11.8) 5. Nitroglycerin (11.0) 6. Propofol (10)	5. Fenylefrine (20.8%) 6. Propofol (14.5%) 7. Vecuronium (12.2%) 8. Midazolam (11.4%) 9. Labetalol (9.1%) 10. Ephedrine (8.6%)
Results	- Potential savings may be achieved through use of prefilled syringes for commonly used anesthetic drugs - But savings might be diminished by disposel of prefilled syringes when they expire		13078 syringes prepared (1month) 139.531 syringes wasted Drug waste varied from 7.8% (urapidil) to 85.7% (ephedrine)		

	- There acould be manufacutinrg issues				
Discussion	- Prefilled syringes could save a lot of thrown away material and medicine - For example ephedrine waste wasted 3 out of 5 times - Goed stuk over dat prefilled syringes te duur zijn	- Education about use, waste and cost is important - Switch to smaller vials - Prefilled syringes -	- 38% of the prepared syringes were discared without being used - Preventable waste: atropine, ephedrine, epinephrine, midazolam - Differecine inprepared and used (like propofol) or prepared and not used (noodmedicatie) - Noodmedicatie hie rook hoogste kosten - Ready to use syringes may make a big impact	- Awareness trainings for staff would be needed -	- Lidocaine was drawn up in routine practice -> but this is not always needed - For midozalam 2.5 ml injectors would be better - Efforts to increase cost awareness : awareness training - Prefilled sryinges -

		- Education of nurses involved		

Paper: propofol wastage in anesthesia Russell F.

result: Propofol is accounted for 45% of he total drug waste by ml. Eliminating the 50 and 100 ml bottles of propofol reduced the facility's propofol waste from 29.2ml a day to 2.8 ml.

conclusions Literature

Paper better preparing propofol

- better preparing Propofol
  - → schema
  - median 68% waste reduction
- better resource stewardship
- standardizing vial selection for infusion
- after completion:
  - 10, 30, 40 en 100 ml vials were d.

economic effects of anesthesia

- drawing drugs in smaller volumes
- increasing awareness
- sharing drugs with different ORs
- routine waste
- prefilled syringes could work

propofol wastage anesthesia

- Propofol accounted for 45% of total drug waste by ml
- strategy: eliminating 50 and 100 ml bottles
  - → only 20 ml

drug wastage contributes significantly to the cost of routine

- suggestie: emergency drugs always kabelen & klaarzetten naar niet optreden
- splitting doses
  - → multidose vials
- use syringe pumps for multiple (remifentanyl/propofol)

evaluation of drugwastage in ors

- 54.3% waste to noodmedicatie
- 38% discarded without being used
- optimize routine preperation of drugs
- education of nurses: cost & wastefulness
  - → short-lived
- PFS: prefilled syringes for rarely used drugs + improvement patient safety

hidden source of dollars

drug use inefficiency

- switch to smaller ampoules
- switch to prefilled syringes
- education to providers about use, waste & costs

preventable drug waste among anesthesia providers

- smaller vials of propofol
- purchase of prefilled syringes (cost-saving method)
  - → good stuk over waarom het niet duurder hoeft te zijn.
  - → prefilled syringe can €26 maken kosten to exceed savings from preventing waste
- experience does not correlate with efficiency
- taking control of environmental and healthcare resource stewardship

anesthesiologist & clinical change

- changing size of vials Propofol (reduce waste by 90%)
- anesthesiologists have ethical obligations to minimize environmental impact through obligation to promote patient health.
- reduce routinely drawn up drugs
- prefilled syringes
- encourage system improvements to address ordering practices that promote...

B Stakeholder analysis

Full stakeholder map:

Actively Engaged Stakeholders:

Anesthetic Nurses:

- Role: Anesthetic nurses play a crucial role in medication administration and waste management in the OR. They handle medication preparation, ensure accurate dosing, and minimize waste.
- Opportunity: acticily participation in waste reduction initiatives and communication with other stakeholders

Anesthesiologists:

- Role: Anesthesiologists are responsible for overseeing anesthesia delivery during surgical procedures. They make critical decisions regarding medication choices and dosage.
- Opportunity: collobartion with other anesthetic nurses to optimize medication usage, prescribe appropriate doses, and ensure safe and efficient anesthesia practices

National Network "The Green OR":

- Role: The Green OR is a national network or initiative focused on promoting sustainable practices and waste reduction in operating rooms across the country.
- opportunity: sharing knowledge and examples of medicine waste minimizing strategies

1.5 OR Logistic Employees:

- Role: OR logistic employees are responsible for managing the supply chain, including inventory control, storage, and distribution of medications in the OR.
- Opporunity: OR logistic employees could actively participate in waste reduction efforts by implementing efficient inventory management systems, optimizing medication storage practices, and minimizing overstocking.

Keep Satisfied

Hospital LUMC:

- Role: LUMC (Leiden University Medical Center) is a specific hospital, representing the broader category of hospitals in this context. LUMC and other hospitals aim to ensure patient safety, cost-effectiveness, and compliance with waste reduction regulations.

Hospital Management:

- Role: Hospital management oversees the overall functioning and performance of the hospital, including OR operations.
- Opportunity: Hospital management supports waste reduction initiatives, provides resources for implementing sustainable practices, and monitors compliance with waste management guidelines.

Hospital Pharmacy:

- Role: The hospital pharmacy is responsible for medication procurement, storage, and dispensing within the hospital.
- Opportunity: The hospital pharmacy collaborates with OR stakeholders to optimize medication supply, facilitate proper storage and expiry management, and ensure accurate dispensing practices.

Surgeons:

- Role: Surgeons are key stakeholders in the OR who rely on appropriate medication usage and availability for successful surgical outcomes.
- Opportunity: Surgeons provide insights into medication requirements, collaborate with anaesthetic nurses and anaesthesiologists to optimize medication usage, and support waste reduction initiatives.

Government:

- Role: Government bodies, such as health departments and regulatory agencies, establish regulations and guidelines related to waste management and sustainability in healthcare.
- Opportunity: The government could set expectations for waste reduction and compliance, promotes sustainable healthcare practices, and monitors adherence to waste management regulations.

Monitor

Patients:

- Role: Patients are the recipients of healthcare services and have a vested interest in the safe and efficient use of medications in the OR.
- Opportunity: Patients could indirectly monitor medication waste through their experience, providing feedback on medication administration, and raising concerns about potential medication errors.

Pharmaceutical Companies:

- Role: Pharmaceutical companies are involved in the production, distribution, and marketing of medications used in the OR.
- Opportunity: Pharmaceutical companies could monitor medication usage and waste to develop strategies for waste reduction, and explore opportunities for product improvement. They could also be transparent about which medications are most environmental friendly.

Operating Room Staff:

- Role: Operating room staff, including scrub technicians and circulating nurses, support the surgical team during procedures and are responsible for managing the OR environment.
- Opportunity: Operating room staff assist in monitoring medication usage, identifying instances of waste, and implementing waste reduction protocols in collaboration with other stakeholders.

Keep Informed Stakeholders:

Research Organizations:

- Role: Research organizations conduct studies and provide evidence-based insights into medication waste management and waste reduction strategies.
- Opportunity: Research organizations can disseminate research findings, best practices, and guidelines to stakeholders involved in medication waste management, keeping them informed about the latest developments in the field.

Dutch Hospitals:

- Role: Dutch hospitals collectively represent a group of healthcare facilities that aim to improve patient care and reduce waste.
- Opportunity: Dutch hospitals share experiences, case studies, and lessons learned in medication waste management, contributing to knowledge exchange and best practice implementation.

Green Team OR:

- Role: The Green Team OR refers to internal sustainability teams or committees within healthcare facilities that focus on environmental initiatives, including waste reduction.
- Oppoortunityt: The Green Team OR keeps stakeholders informed about sustainability practices, waste reduction strategies, and provides support in implementing environmentally friendly approaches in the OR.

C Measurement form

Observatie OK medicijn afval week 20-24 mrt 2023

Datum:

Soort operatie

Duur:

Tijd begin:

Tijd eind:

OK nr: ☐

..... / .....

Excel: ☐

		Over in [ml]	Over in [ml]	Over in [ml]	Over in [ml]
Hypnotica	propofol 10 ml	propofol perfusor 10mg/ml	midazolam 50 ml	esketamine 5 mg/ml 10 ml (>10 kg)	
	propofol 20 ml	etomidaat	thiopenthal	esketamine 5 mg/ml 20 ml (>10 kg)	
	propofol 50 ml	midazolam 5 ml	esketamine 1 mg/ml 20 ml (<10 kg)		
Opiaten	sufentanil 10 ml, 5 mcg/ml	sufentanil perfusor 20 ml, 5mcg/ml	alfentanil	fentanyl 5 mcg/ml (<10 kg)	
	sufentanil 50 ml, 1 mcg/ml	sufentanil bolus 2ml, 5mcg/ml	morfine	fentanyl 25 mcg/ml (10-20 kg)	
	sufentanil 50 ml, 5 mcg/ml	remifentanil	methadon	fentanyl 50 mcg/ml (>20 kg)	
Relaxantia	rocuronium 5 ml	rocuronium 10mg/ml bolus 2,5 ml (10-20kg)	suxamethonium		
	rocuronium 20 ml	atracurium 5 ml	mivacurium		
	rocuronium 10mg/ml bolus 1ml (< 10kg)	atracurium 20 ml			
Circulatie bolus	ephedrine	atropine	fenylefrine 50 mcg/ml (>20 kg)		
	adrenaline 10 mcg/ml (100 ml)	fenylefrine 10 mcg/ml (<20 kg)			
Circulatie continu	noradrenaline 1 mg/50 ml (<10 kg)	dobutamine 125 mg/50 ml (10-20 kg)	dopamine 200 mg/50 ml	milrinon 200 mcg/ml 50 ml (10 mg in 50 ml)	
	noradrenaline 2 mg/50 ml	dobutamine 250 mg/50 ml	adrenaline 1 mg/50 ml	milrinon 400 mcg/ml (20 mg in 50 ml)	
	noradrenaline 10 mg/50 ml	dobutamine 500 mg/50 ml	adrenaline 2 mg/50 ml	fenylefrine 50 ml	
	dobutamine 62,5 mg/50 ml (<10 kg)	dopamine 40 mg/50 ml	adrenaline 10 mg/50 ml		
Overige medicatie	paracetamol	cefazoline 2 gram	oxytocine 10 IE/50 ml	calcium 20 ml	
	diclofenac	tranexaminezuur 20 ml	oxytocine 5 IE	magnesium 10 ml	
	dexamethason 4 mg	tranexaminezuur 50 ml	sugammadex	magnesium 20 ml	
	dexamethason	tranexaminezuur 100mg/ml bolus 1ml (<10kg)	heparine (5000 IE/ml) 5 ml	metamizol	
	ondansetron	tranexaminezuur 100mg/ml bolus 5ml (10 -20 kg)	heparine (5000 IE/ml) 1 ml (<10 kg)		
	cefazoline	hydrocortison	heparine (5000 IE/ml) 2 ml (10-20 kg)		
	cefazoline 1 gram	insuline	calcium 10 ml		

		[ml]	[ml]	[ml]	[ml]
Regionale Anesthesie medicatie	lidocaine 1%	ropivacaine 0,375%	ropivacaine 1% 20 ml	prilocaine 1%	
	lidocaine 2%	ropivacaine 0,5%	bupivacaine	prilocaine 2%	
	ropivacaine 0,2%	ropivacaine 0,75%	bupivacaine heavy	fentanyl 20 mcg spinal	
Overige medicatie					
Overig	NaCL 0,9% 50 ml	Gluc/Ringers 50 ml	Ringerlactaat 50 ml		
	NaCL 0,9% 20 ml	Gluc/Ringers 20 ml	Ringerlactaat 20 ml		

Bridion? ☐

Waarom is het over?

D Ideation

MINDER MEDICATIE AFVAL OP DE OK... Hoe?

Gids | Voorbeelden | Connect
- beste ideeën
- failures
- stuur idee in!

① Breng het in kaart
- me's & parameters → TOP 5 hoogste verspilling & kosten
- template download (Excel template)

| vergelijk |

② Bewustwording
- invul
- milieu
- hersporen
- rapport
- gesprek koffiekamer

③ Actie
Anesthesie overleg:
- concentraties
- technologiën
- gepast voorschrijven

(duidelijke regels)

INKOOP
- koop het in, kan dit?
- budget

BELEID
- trainingen
- ....
- ....

→ pas het aan op anesthesie lijst

GEDRAG
- geef feedback
- hulpmiddelen download

④ Doe nieuwe meting
- vergelijk

(herhalen)

deel best practices

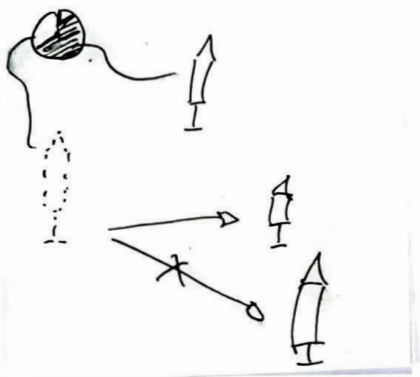
deel ook wat niet werkt

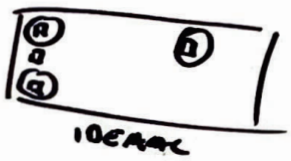
termijn

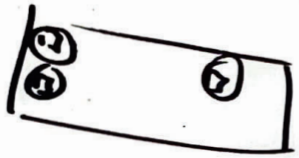
beheerder:
Werkgroep medicijnresten Groene OK

publiek:
- anesthesie
- management
- logistiek

vision: why
strategy: where & how
roadmap: what







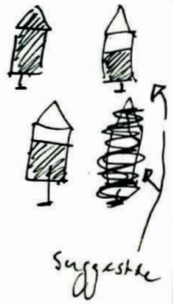
MOMENT VOOR

conclusie

verzoek

1 PROPOFOC

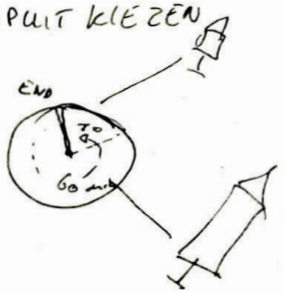
2. SUFENATINE



DIGITAAL

! Dubbel check

② SPLIT KIEZEN



MOMENT ZELF van invullen

IDEAAL KAAR

US

NIET IDEAAL + / -

DIGITAAL

SUGGESTIE

① COMMUNICATIE

TIJD

Alrijne
- terugslagklep — meeste winst — mailen
  - Anne van Dalen
- kostenbesparend

Alrijne

Afval roadmap
- veel mensen geen idee van kosten
- afvalstroom

Bewustwording — waar medicatie weggooien

Propofol 1 %
2 %

↕

meer nadenken over dosis & duur OK

Remifentanil
500
42 ↓ — hogere concentratie — teveel wennen — foutgevoel

terugslagklep

piep 1
5 min

piep 2
leeg

begin:

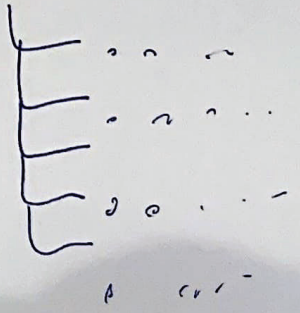
fenyl klaargemaakt — kleinere ampullen
- 10 cc gebruik je nooit

daarna

Sessie Rixt


SNEL
HKJ stimuleren dat de kleinere ampul gebruik wordt ?
visuele nudges
meerdere visuele cues
verpakking
betere plek
default option
geen andere keus meer
20& 30 ml zijn de norm
Feedback moment
inspiratie
Good idee?
beloning
iets nuttigs waarop het bijgehouden beloning kan worden
.... € bespaard
infographic
economic & environmental
training
benefits of choosing the smaller ampoule
guidelines

behoeftes medewerkers:



medicijnen extra laten opvallen

MEER TIJD.

HCP stimuleren dat de juiste hoeveelheid aangekruist wordt op het boodschapperlijstje?!

visueel
- kleur
  - propofol
- prijs
- groter maken:
  - propofol
  - noradrenaline
  - ....
- border
  - propofol
- label milieu

milieu symbool met extra informatie

bij standaard operaties automatisch

standaardlijst met kleinste ampullen aangekruist

2e dosis aangeven op 1e 2e 3e lijstje

propofol: ... ...

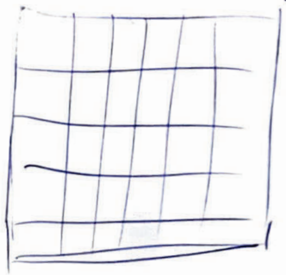
reward?
- mogelijk BSL invullen
- ritueel:
  - laatste moment

informeren
- quiz
- spel
- presentatie
- cursus
- elearning
- boek
- podcast
- infographic
  - geurig
- onderweg naar werk

proper dosing
economic & environmental benefits

HKJ zorgen dat de kleinere ampul wordt gepakt?

- grotere ampullen weglaten = 8orce
- aantrekkelijker maken
- meer keus van ampullen
- of juist minder.
- kleur code: label / visual cue
  - op ingunspomp
  - HIX systeem
  - op de kar.



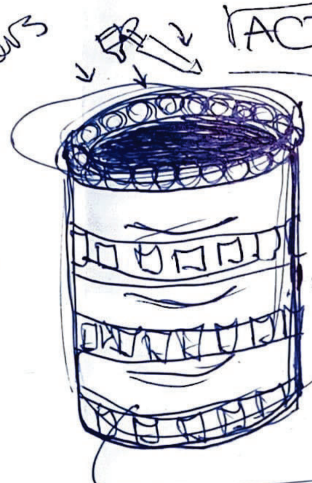
- Am zelf inschatten overleg anesthesioloog
- In het HIX systeem aangeven dat voor optie 2 er een kleinere ampul gebruikt kan worden
- hulpmiddel: rekentool?
- betere plek in de kar

Gepast voorschrijven

HKJ zorgen dat de kleinere ampul eerder wordt aangekruist

- propofol rekentool
- sociale controle
  - A
  - AM
- zichtbaarheid
  - Groter maken
  - kleur
  - Gewicht tool

ACTIE



facilitair bedrijf
- Floris

kosten
- communicatie
- op de OK hangen

lijstje footprint
personen auto
100 km = 4 km rijden
1 kcal 4.5 km auto

suggestie
simpel duurzaam.nl

infographic
5 tips
socials

inspectie gezondheidszorg
- terugslagklem

20 ml 50 ml
- 70 kg

6 juni
11-12
14-15

1. creeër een stroom voor geneesmiddelen
2. Propofol
3. gepast voorschrijven
4. voorgevulde spuiten
5. logistiek: voorraad

anesthes :)
- fixt van de enden
- opleiding tot anesthesist

remond van den oudenrand
- anesthesie medewerkers

lijste met ingrepen:
- vaak nu persoonlijke voorkeur
  - iemand anders

achtergrond informatie

bewust voorschrijven
- anesthesistie afstemmen

boodschappenlijste
- standaard hetzelfde
- ook gedrags verandering

gedraags verandering

afstemmenen
Anesthesie medewerker duur

Propofol:
- voorgevuld
- voorgevuld communicatie
- van gebriek

propofol 10 ml
propofol 20 ml
propofol 50 ml

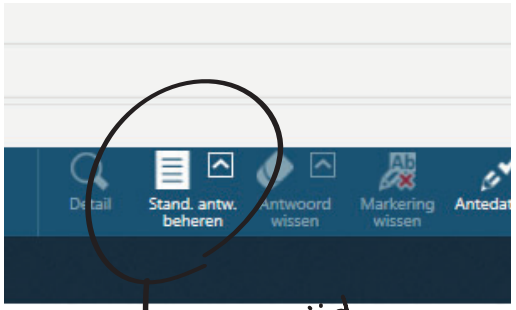
sufentanil 10 ml, 5 mcg/ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)

propofol 10 ml
propofol 20 ml
propofol 50 ml

sufentanil 10 ml, 5 mcg/ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)



Dit altijd hebben klaarstaan

Let op:

Remifentanil
Noradrenaline
Propofol
Sufentanil
Rocuronium

Noodmedicatie: ephedrine & fenylefrine
--> zijn ze nodig nu al op te trekken?

1e dosis | 2e dosis

propofol 10 ml
propofol 20 ml
propofol 50 ml

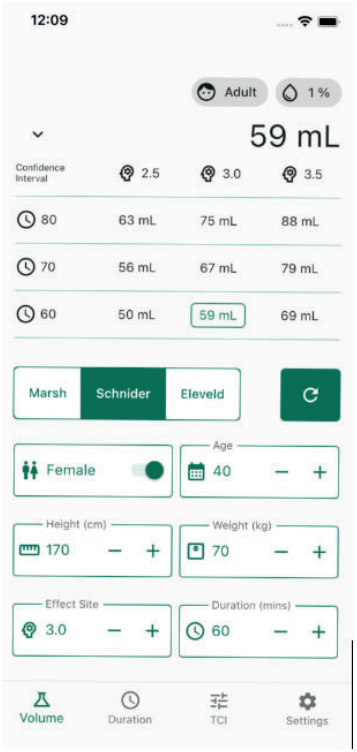
sufentanil 10 ml, 5 mcg/ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)

propofol 10 ml
propofol 20 ml
propofol 50 ml

sufentanil 10 ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)



Aantal

propofol 10 ml
propofol 20 ml 3
propofol 50 ml

sufentanil 10 ml, 5 mcg/ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

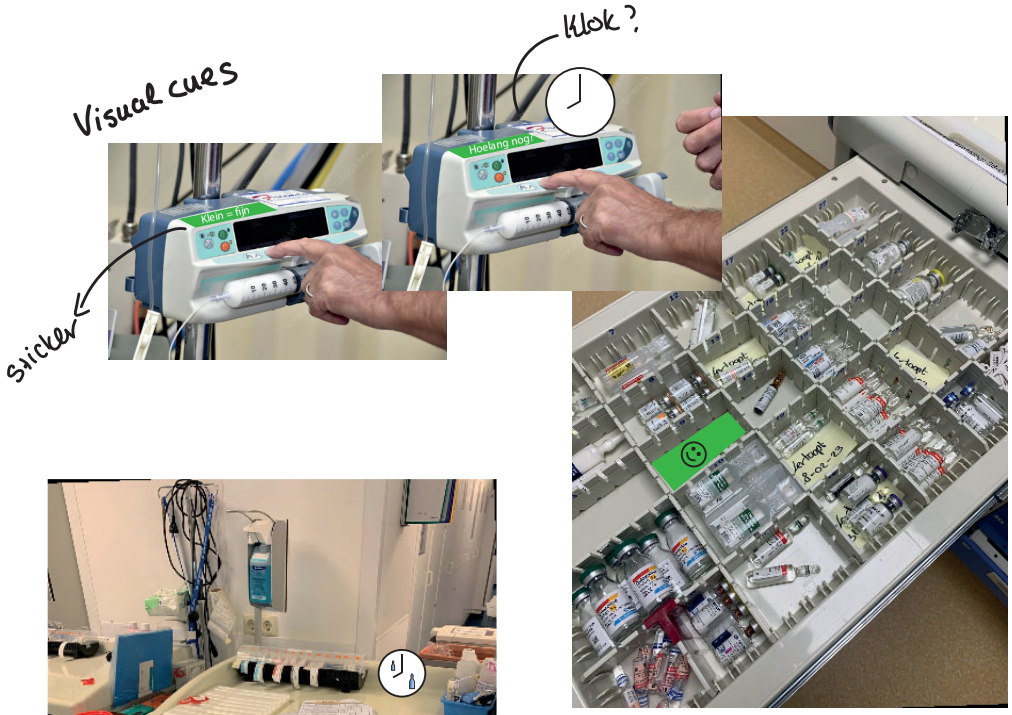
rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)

propofol 10 ml
propofol 20 ml
propofol 50 ml

sufentanil 10 ml, 5 mcg/ml
sufentanil 50 ml, 1 mcg/ml
sufentanil 50 ml, 5 mcg/ml

rocuronium 5 ml
rocuronium 20 ml
rocuronium 10mg/ml bolus 1ml (< 10kg)

Visual cues



Voorgevulde spuit

\+ niet gebruikt is geen verpilling
\+ tijdbesparing

\- duur!
maar zou het duurder zijn dan de verspilling

Terugslagklepje

wordt in Afrijne & MST weer gebruikt

Cijfers

TOP 5:
1. Propofol
2. Rocuronium
3. Sufentanil

€. .....

€1/kg

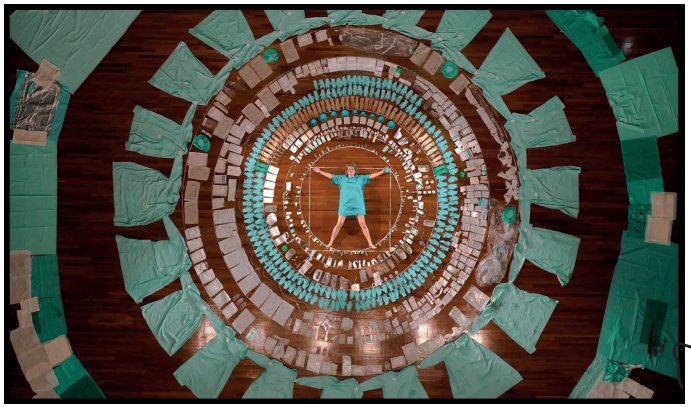
5 praktische tips:

1. ~~~~~
2. ~~~~~
3. ~~~~~
4. ~~~~~
5. ~~~~~

Video met expert

Animatie

Kunstwerk

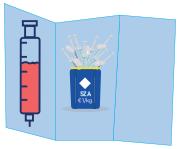


Oogesthetisch krachtig

Foto's van de verspilling

De koffiekamer

Podcast



Soort menukaart met:
- feitjes
- cijfers
- tips
- QR code voor extra tips

Educatie & trainingen

Duurzame gesprekskaarten

Wat denk jij over duurzamheid?	Wist je dat ..... spuiten per dag worden weggooid	Dit zou je kunnen doen tegen verspilling ...

Quiz kaarten

Wat heeft een hogere CO2 uitstoot ... of	Wat heeft een hogere CO2 uitstoot ... of .....

Duurzaam idee

- - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - -

De Groene OK

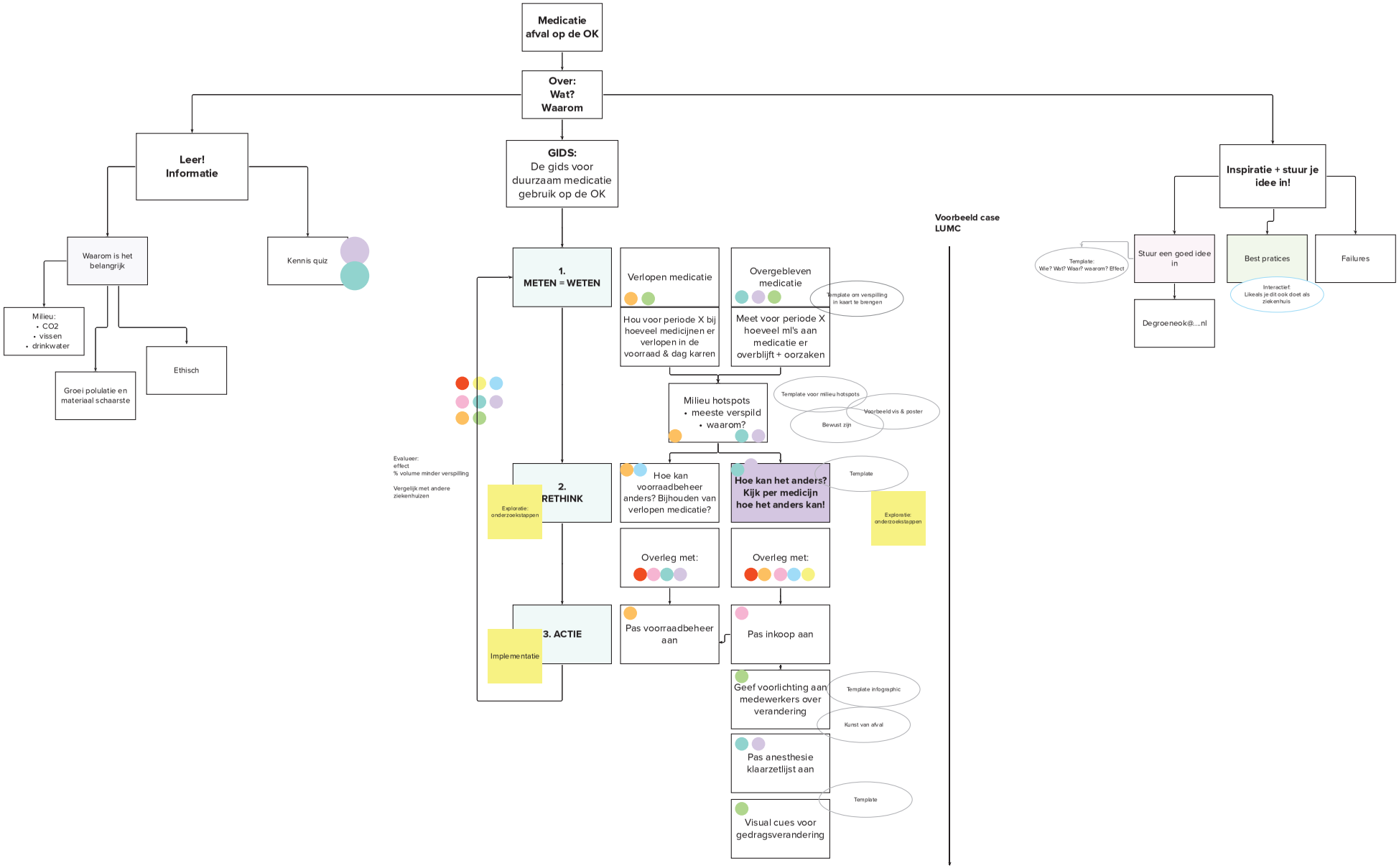
MedWise: De gids voor duurzaam medicatie gebruik op de OK

Stakeholders

- Anaesthetic nurses
- Anaesthesiologists
- Logistics employees
- Hospital pharmacy
- Procurement: is het mogelijk?
- Infectiepreventie: is het veilig?
- Management: is het financieel haalbaar?
- Green Team OR / anesthetica

Doel: Het verminderen van medicatie afval en stimuleren van duurzaam medicijn gebruik

Doelgroep: Anesthesie Green Team
Green Team OK



Welk alternatief moeten we kiezen?

LEGENDA:

- An esthesie medewerkers
- An esthesiologen
- Logistiek OK
- Ziekenhuis apotheek
- Inkoop
- Infectiepreventie: is het veilig?
- Management: is het financieel haalbaar ?
- Green Team OK / anesthetica
- Fabrikant

Hoe kan het anders? Kijk per medicijn hoe het anders kan!

Bijvoorbeeld Propofol

Zet een doel: X procent minder verspilling + tijdspan

Bijvoorbeeld:
25% kleinere verspilling volume propofol
Periode: 1 dag
40 operaties

Mogelijke alternatieven

???

Kleinere maat medicatie (bijv van 10 ml naar 5 ml)

Bedenk welke nieuwe maat je graag zou willen

Breng de besparing in kaart

Bijvoorbeeld als we 5 ml gerbuiken ipv besparen we X aantal ml per jaar = X aantal kosten

Overleg met de apotheek of dit mogelijk is

Ja het is mogelijk

Past het in het budget?

Ja

Stel de hoeveelheid vast die nodig is en laat de apotheek de nieuwe maat bestellen

Nee

Overleg met management dat het nodig is & dat het uiteindelijk juist kosten bespaart

Helaas de fabrikant heeft het niet

Koppel terug aan de fabrikant dat er vraag is naar de kleinere maat

Geef aan op de Groene OK site dat hier vraag naar is en connect met andere ziekenhuizen

Bedenk of de nieuwe maat er extra bij komt of de huidige maat vervangt

Communiceer de verandering naar

Logistiek

Creeër nieuwe barcode etc

??

AM en anesthesiologen

Pas het aneshtesie klaarzetlijst aan

Pas het protecol aan

Geef voorlichting

Maak gebruik van visuel cues en geheugen steuntjes om de verandering te ondersteunen

Kies de kleine maat! De milieu bewuste keuze

Terugslagklepje

Doe onderzoek naar risico's

Kijk naar voorbeelden bijv MST en Alrijne

Verzamel literatuur op de Groene OK

Hoe vaak kan je het terugslag klepje gebruikt worden

Veiligheid

Breng de voordelen in kaart

Bijvoorbeeld als we 5 ml gerbuiken ipv besparen we X aantal ml per jaar = X aantal kosten

Benader inkoop & bestel

Wat zijn de kosten en weegt het op tegen de kosten van verspilling

Vraag aan management of dit financieel kan

Communiceer de verandering naar

Logistiek

Creeër nieuwe barcode etc

??

AM en anesthesiologen

Geef voorlichting

Maak gebruik van visuel cues en geheugen steuntjes

Pas het protecol aan

1 medicijnen registereren op meerdere patieënten

Spike

Doe onderzoek naar risico's

Kijk naar voorbeelden bijv MST en Alrijne

Verzamel literatuur op de Groene OK

Hoe vaak kan je het terugslag klepje gebruikt worden

Veiligheid

Breng de voordelen in kaart

Bijvoorbeeld als we 5 ml gerbuiken ipv besparen we X aantal ml per jaar = X aantal kosten

Benader inkoop & bestel

Wat zijn de kosten en weegt het op tegen de kosten van verspilling

Vraag aan management of dit financieel kan

Communiceer de verandering naar

Logistiek

Creeër nieuwe barcode etc

??

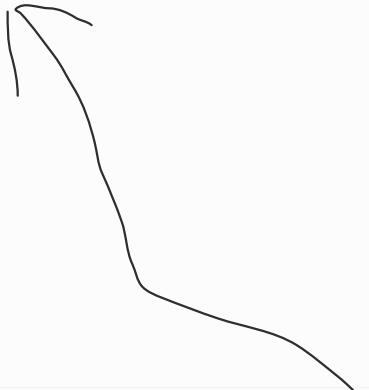
AM en anesthesiologen

Geef voorlichting

Maak gebruik van visuel cues en geheugen steuntjes

Pas het protecol aan

1 medicijnen registereren op meerdere patieënten



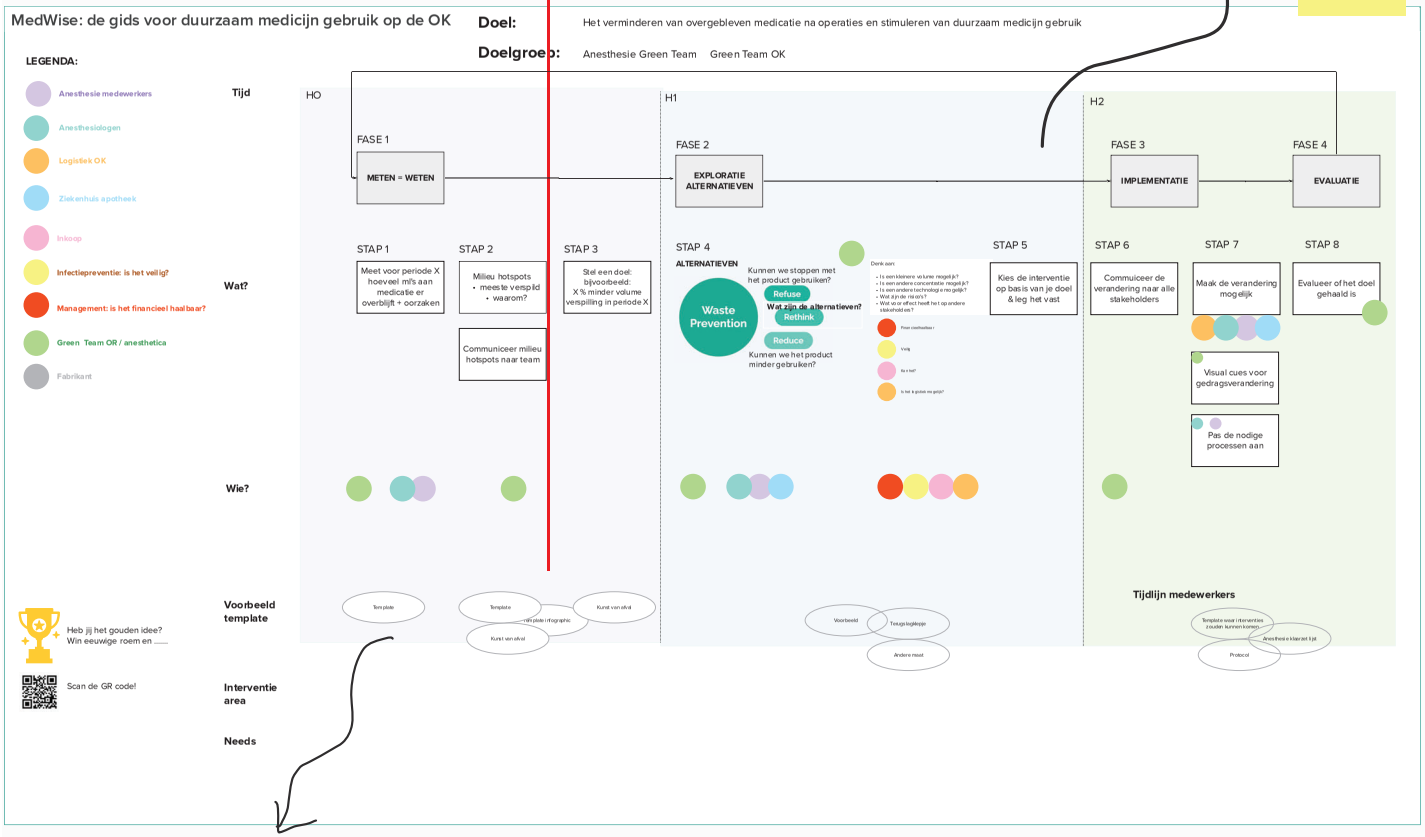
V. Het verminderen van de milieubelasting van medicatie(gebruik)

Het gebruik van medicijnen zorgt voor medicijnresten in het grond- enoppervlaktewater. Dat komt onder andere door medicijnresten in urine en ontlasting en doordat ongebruikte medicijnen door de gootsteen worden weggespoeld. Ook heeft de productie van geneesmiddelen klimaat- en milieu-impact. Dit schaadt het milieu en de leefomgeving.

De Groene OK

GIDS

Tips waarmee je morgen al aan de slag kan



Dingen waar je morgen al mee kunt beginnen:

Bewustzijn:

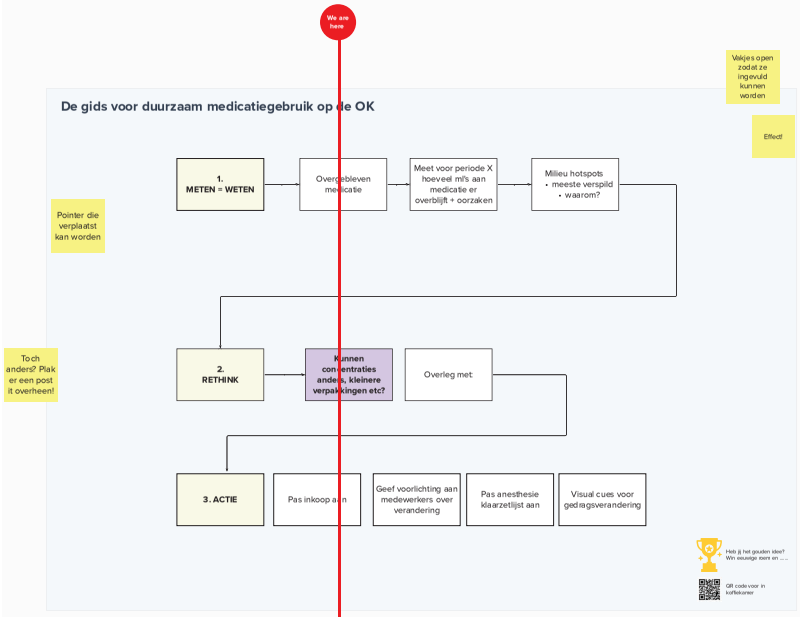
deel cijfers van verpsilling
Vis
Start gesprek met medewerkers

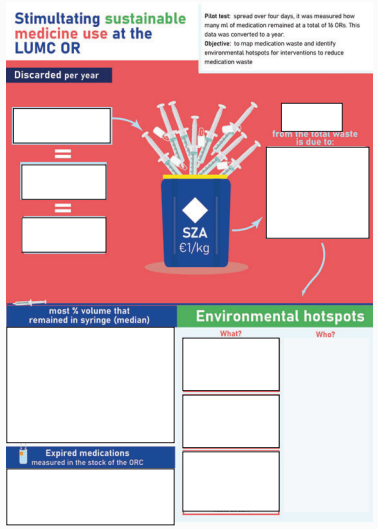
Kies de kleinere ampul propofol

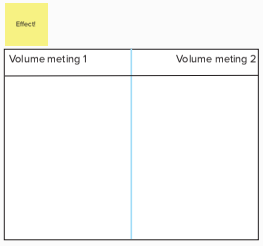
Als er een kleinere ampul is, kies de kleine ampul

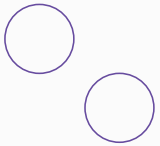
Ondersteunende literatuur
Template behaviour change
Fact sheet

Kies 1/25 ml noor ipv 2 op 50









DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: van Amelsfort 6319

initials: N.M.H.A given name: Noor

student number: 4555279

street & no.:

zipcode & city:

country:

phone:

email:

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD (★) DfI ( ) SPD

2nd non-IDE master:

individual programme: - - (give date of approval)

honours programme: ( ) Honours Programme Master

specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Jan-Carel Diehl dept. / section: SDE-DfS

** mentor: Sonja Paus-Buzink dept. / section: HCD-AED

2nd mentor: Dinemarie Kweekel

organisation: LUMC

city: Leiden country: Netherlands

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Jan-Carel Diehl date 06 - 03 - 2023 signature Jan-Carel Diehl Digitally signed by Jan-Carel Diehl Date: 2023.03.06 12:58:56 +01'00'

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 54 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 30 EC

List of electives obtained before the third semester without approval of the BoE

★ YES all 1st year master courses passed

NO missing 1st year master courses are:

name Robin den Braber date 10 - 03 - 2023 signature Robin den Braber Digitaal ondertekend door Robin den Braber Datum: 2023.03.10 14:24:33 +01'00'

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: ★ APPROVED NOT APPROVED

Procedure: ★ APPROVED NOT APPROVED

comments

name Monique von Morgen date 21 - 03 - 2023 signature Jan-Carel Diehl Digitally signed by Jan-Carel Diehl Date: 2023.03.01 16:22:12 +01'00'

Reducing medicine waste in the OR — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 07 - 02 - 2023 — 02 - 07 - 2023 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Every year, at least 100 million Euros worth of medication that is reinforced in primary care is thrown away; figures on drug waste in hospitals are still hardly available. In addition to incurring unnecessary costs, throwing away unused medication also has a huge impact on the environment. The Netherlands' healthcare industry is accountable for roughly 8% of the nation's yearly greenhouse gas emissions (Steenmeijer et al., 2022). This has an estimated 18% share in drug production, distribution, and consumption (Gupta Strategists, 2019). The contribution of chemical products, including pharmaceuticals in particular, is responsible for 41.2% of healthcare CO2 emissions, out of all the goods and services that are acquired in the industry (RIVM, 2022). The environmental impact is not limited not just greenhouse gas emissions. Most of the consumption of raw materials and clean water within healthcare is also attributable to this category (79.7% and 63.2%, respectively) (RIVM, 2022). Also, at least 190,000 kg of drug residues enter surface and groundwater (RIVM, 2020).

Making healthcare more sustainable will become an increasingly important theme in practice, policy-making, training and science (Alhamad et al., 2017). The LUMC therefore aims to minimize the amount of medicines in hospital waste and wastewater. At LUMC, there is no clear data on how much medications are discarded. There is a need for practical guidelines on how to reduce medicine waste at the OR that can be implemented, not only in the LUMC, but in other hospitals as well. The assignment is initiated by the Medical Delta foundation in collaboration with Dinemarie Kweekel, hospital pharmacist at LUMC. This assignment is in line with the vision of the "De Groene OK", where Dinemarie is one of the members of the "anesthesia vapors and drug residues" working group. "De Groene OK" is a national network that accelerates sustainability of care processes in ORs in the Netherlands.

All stakeholders regarding this project are shown in figure 1. The main stakeholders are the LUMC healthcare providers, the hospital pharmacy and the hospital it self. Opportunities that I am currently aware of are for example the Green Deal. Many hospitals have committed to making processes and practices more sustainable by signing the Green Deal 2.0 'Sustainable care for a healthy future'. The Ministry of Health has recently released the renewed Green Deal 3.0 'Sustainable Care,' which includes agreements on reducing the ecological footprint of healthcare (Greendeals, 2018). Besides sustainability, reducing medicine waste could also result to saving costs for the LUMC. Limitations could be the lack of proper regulations and guidelines for medication return and disposal. Further more there could be resistance from the hospital staff to change their practices and procedures.

SOURCES:
1. Steenmeijer MA, Rodrigues JFD, Zijp MC, Waaijers-van der Loop SL. The Environmental footprint of the Dutch healthcare sector: beyond climate impact. 18 mei 2022 (epub) doi:10.2139/ssrn.4081076.
2. Een stuur voor de transitie naar duurzame gezondheidszorg: kwantificering van de CO2 uitstoot en maatregelen voor verduurzaming. Amsterdam: Gupta Strategists; 2019.
3. Het effect van de Nederlandse zorg op het milieu. Bilthoven: RIVM; 2022.
4. Medicijnresten en waterkwaliteit: een update. Bilthoven: RIVM; 2020.
5. Green Deal 'Duurzame zorg voor gezonde toekomst'. 2018 www.greendeals.nl/green-deals/duurzame-zorg-voor-gezondetoekomst.

space available for images / figures on next page

introduction (continued): space for images

	Healthcare providers (nurses, doctors)	Pharmacists	Hospital	Goverment and regulators	Patients	Pharmaceutical companies	Research organizations (like TU Delft)	The enviroment
Interest	• Reducing waste • Improvining patient outcomes • avoiding potential liability	• Reducing waste • Efficiency	• Controlling costs • Improving efficiency • Maintaining a positive reputation	• Promoting public health & safety • Reducing healthcare costs • Ensuring that healthcare organizations comply with regulations towards drug disposal.	• Receiving safe, effective and efficient medical care with minimal waste and risk.	• Reducing drug waste • Promoting resposnible use of their products	• Knowledge • Positive reputation	Getting less waste
Role	• Ensuring that medications are ordered and administered correctly. • Ensuring that unused or expired medications are properly disposed of.	• Provide valuable expertise in areas such as medication storage and inventory management • Help to ensure that the right medications are available when needed.	• Creating and implementing policies and procedures to reduce medicine waste. • Providing the necessary resources and infrastructure to support these efforts.	• Creating and enforcing regulations and guidelines for medication return and disposal • Provide funding and other support for waste reduction initiatives. • Creating awareness	• Ensuring that any medications they bring home from the hospital are properly stored and disposed of.	• Developing more sustainable packaging (or adjsuting packaging sizes) and labelling options, which can help to reduce waste and patient safety. • Extend expiration date	Conducting research on best practices for reducing medicine waste in the OR and in evaluating effectiveness of differnt solutions.	

image / figure 1: Stakeholders Medicine Waste in the Hospital

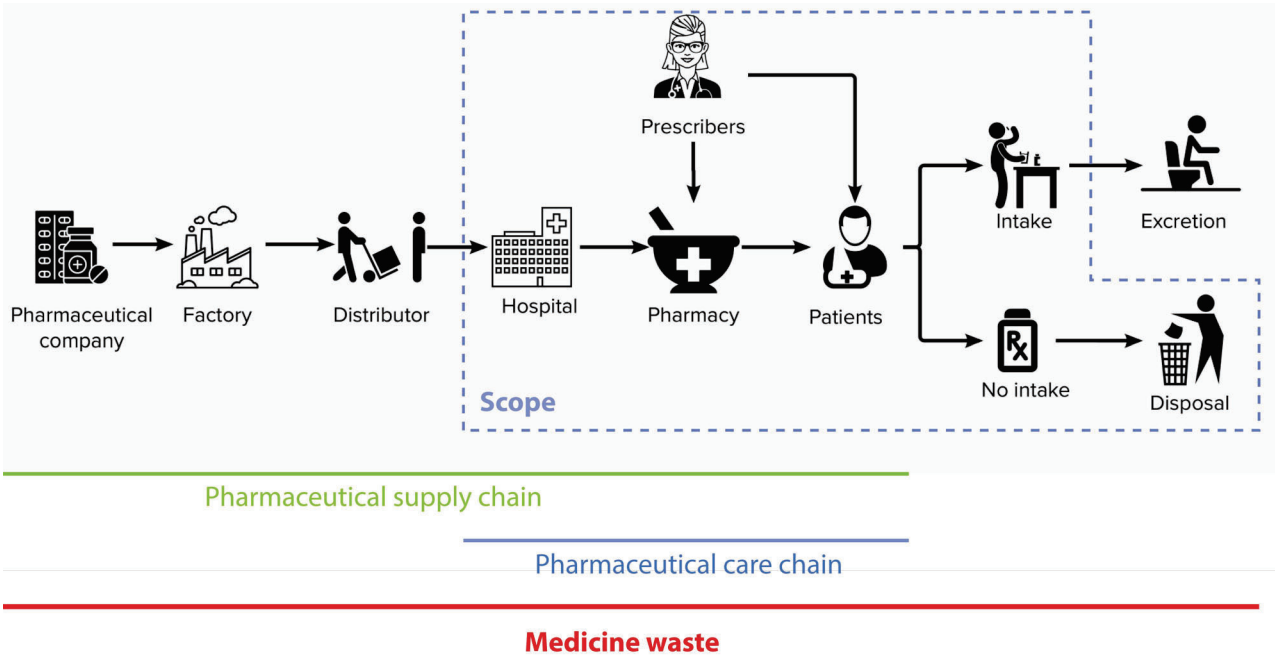


image / figure 2: Medicine waste in pharmaceutical chain

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The use of medication in both healthcare and society at large is crucial for the treatment and prevention of illnesses and symptoms. Any drug that is unused along the full pharmaceutical supply and use chain is referred to as medicine waste (see figure 2). When this garbage is dumped into the environment, it can have significant negative effects on the environment and the economy due to the financial loss. The reduction of pharmaceutical waste may have a major impact on healthcare costs, the efficient use of healthcare resources, and the limitation of medication waste-related environmental damage.

The scope of the project will be the pharmaceutical care chain(see figure 2). So the first part of the pharmaceutical supply chain will be excluded from the scope to fit the project within the 100 days. The project will be limited to medicine waste in the ORs of the LUMC.

Medicine waste includes:
- the excessive or unnecessary use of medicines
- unused medicines that are returned tot the pharmacy
- expired medicines
- remaining medicines that are disposed

I am going to examine every pharmacological waste at the OR, with the exception of anaesthetic damps. This is due to the fact that the "Groene OK" already provides information and recommendations on anaesthesia damps but lacks it on other medicine waste.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

During the research I will measure and find the cause of medicine waste in the LUMC OR. Using this knowledge, practical guidelines will be developed that can be implemented in the LUMC OR. One of these guidelines will be translated into a lo-fi prototype. Visual communication will be used to communicate and summarize the findings of the project.

Research part 1: measuring the medicine waste at the OR
- Measuring the quantity of medicine waste
- Define environmental and financial impact

Research part 2: find the causes of medicine waste
- Observing at the operating rooms
- Interviewing OR and pharmacy staff

Analyse phase:
- Clustering insights
- Finding environmental hotspots and design opportunities

Design phase:
- Developing practical guidelines
- Translating one of the guidelines into a design with a lo-fi prototype
- Making visualization of Medicine Waste in the OR to summarize and communicate findings of the project

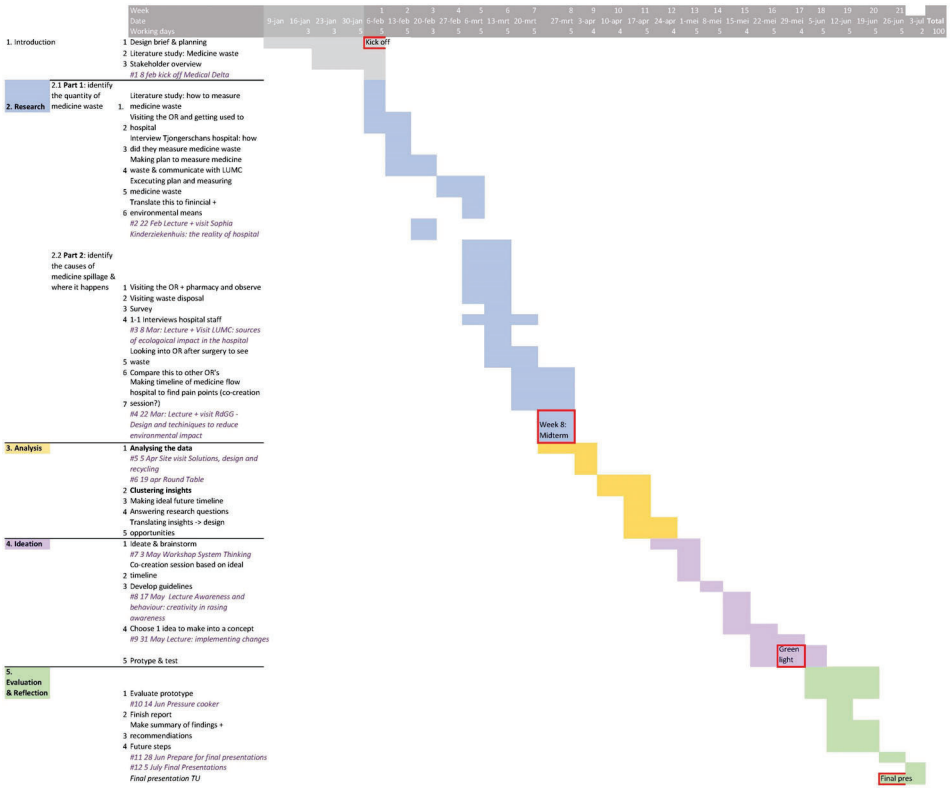
Initials & Name N.M.H.A van Amelsfort 6319 Student number 4555279

Title of Project Reducing medicine waste in the OR

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 7 - 2 - 2023 2 - 7 - 2023 end date



Initials & Name N.M.H.A van Amelsfort 6319 Student number 4555279

Title of Project Reducing medicine waste in the OR

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

I think this thesis project is a really cool opportunity to get a look inside the LUMC and see what it is like there. I am not very familiar with hospitals, but I always found it interesting. I will be observing in the OR which I think will be a special opportunity. The project is part of the Sustainable Hospitals Lab of Medical Delta. Several students from different studies are participating in this project, each with a different subject. I think we can learn a lot from each other during this project. There are also workshops and lectures on the theme of sustainable hospitals, which I think will be a good addition to my graduation project. This network is likely going to bring me in contact with a lot of experts in the field, and I think this will be very valuable for my project and possible future career.

My personal motivation for choosing this specific topic of the lab is that their is not much known about the topic. A lot of attention is given to waste reduction/recycling of disposables, and the use of volatile anaesthetics, but much less is known about the medicine waste. I am excited to discover and gain more in depth knowledge on this topic!
This project is a perfect opportunity to work closely with the stakeholders and involve them in the project. This is something I have not done that much in past projects so I want to experience and learn more about this.

One of the skills I want to improve are my communication skills. This includes presentations, as well as communication with various stakeholders and visual communication. I want to work on my digital drawing skills to clearly communicate the findings of my research.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name N.M.H.A van Amelsfort 6319 Student number 4555279

Title of Project Reducing medicine waste in the OR