Practicing the legal right to protect every oncology worker – Generating Evidence through JOPP study and UKONS PECAN study

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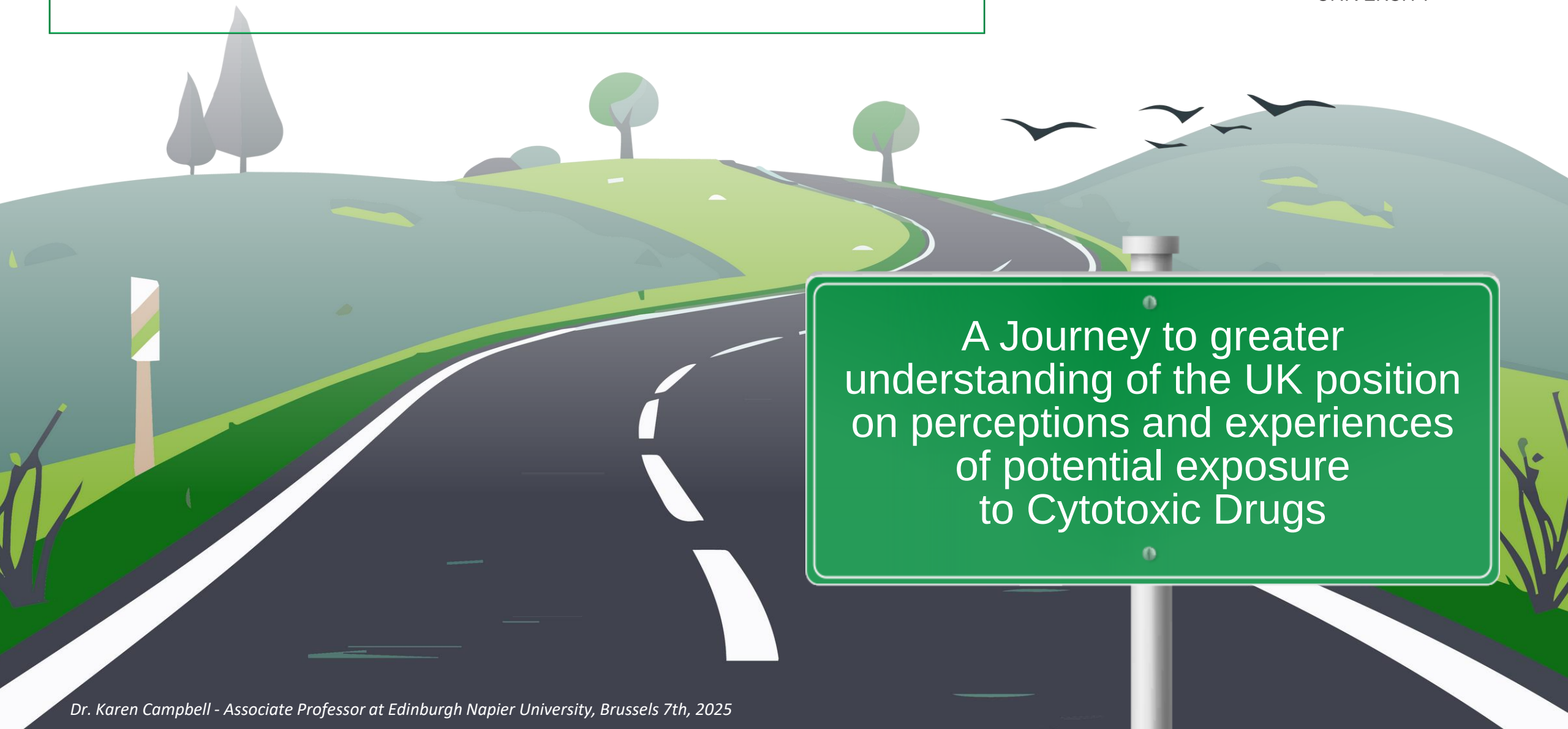


Dr. Karen Campbell - Associate Professor at Edinburgh Napier University, Brussels 7th, 2025

@PeCan study

was awarded a competitive grant by

UKONS

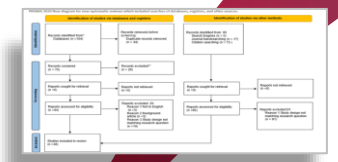
Oncology Nursing Society

AIM OF THE STUDY

The aim of this study is to explore and gain an understanding of nursing experiences and perceptions, in the context of current and past practice, of potential occupational exposure to cytotoxic drugs

2022

Workshop at UKONS
November 2022



Systematic review N=38
March 2022- February 2024

UK survey N=675
September 2022- August 2023

Individual interviews N=32
January 2023-August 2023

2023

Workshop at UKONS
November 2023

Triangulation & Synthesis

Final project results
UKONS 2024

Publications

Overarching methodology ‘Framework Synthesis’

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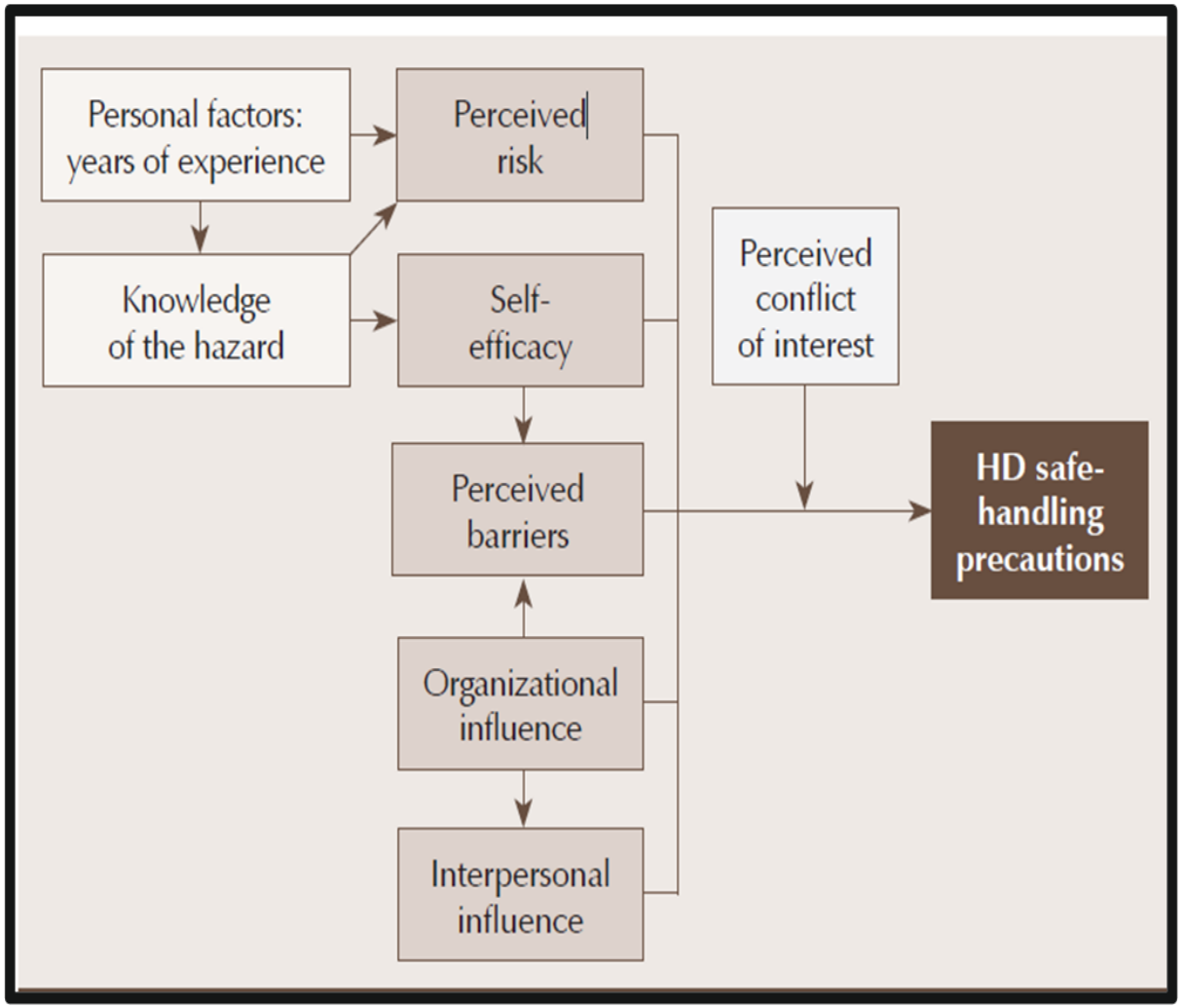

Theoretical framework: factors predicting use of hazardous drug (HD) safe-handling precautions (Polovich and Clark 2012). From “Predictors of Hearing Protection Use for Hispanic and Non-Hispanic White Factory Workers,” by D.M. Raymond 3rd, O. Hong, S.L. Lusk, & D.L. Ronis, 2006, Research and Theory for Nursing Practice: An International Journal, 20, p. 129. Copyright 2006 by Springer Publishing Company, LLC. Adapted with permission.

SYSTEMATIC REVIEW | OPEN ACCESS

Global Cancer Nurse's Experiences and Perceptions of Potential Occupational Exposure to Cytotoxic Drugs: Mixed Method Systematic Review With Framework Synthesis

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Received: 27 February 2024 | **Revised:** 24 September 2024 | **Accepted:** 27 September 2024

Funding: This work was supported by UK Oncology Nursing Society.

ABSTRACT

Aim: To conceptualise experiences and perceptions of cancer nurses' potential for occupational exposure when dealing with cytotoxic drugs (CDs).

Design: A mixed methods systematic review with framework synthesis.

Methods and Data Sources: A literature search was conducted in February 2022 in CINAHL PubMed, Web of Science, Ovid Nursing, and PsycINFO, and it was reported using the PRISMA guidance.

Results: A synthesis of 38 studies revealed new categories of perceived solutions, side effects, and risky behaviour as well as three levels of experience and perception: individual, shared, and cultural, rather than the a priori theory.

Conclusions: The review conclude that individuals espouse safe handling and administration of CDs. Synthesis highlights a complex interplay between self-reported perception and the observed experience of potential occupational exposure to cytotoxic drugs.

Implications for Professional Practice: The framework synthesis highlights the difference between the perception of espoused practice and the experience of practice. Observation and risk assessment must be used to enhance safe practice. Organisations must take seriously the perception and experience of the adverse effects of administering cytotoxic drugs to support cancer nurses.

Reporting Method: Joanna Briggs Institute's (JBI) methodology for systematic reviews and framework synthesis indexed studies deductively and inductively.

No patient or public contribution.

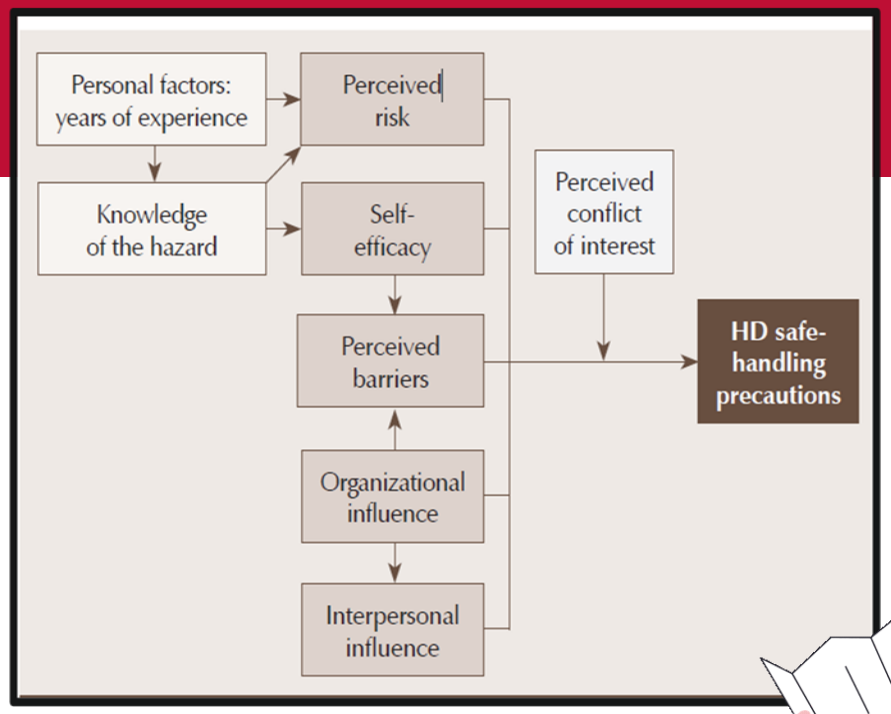
Trial Registration: PROSPERO: CRD42022289276

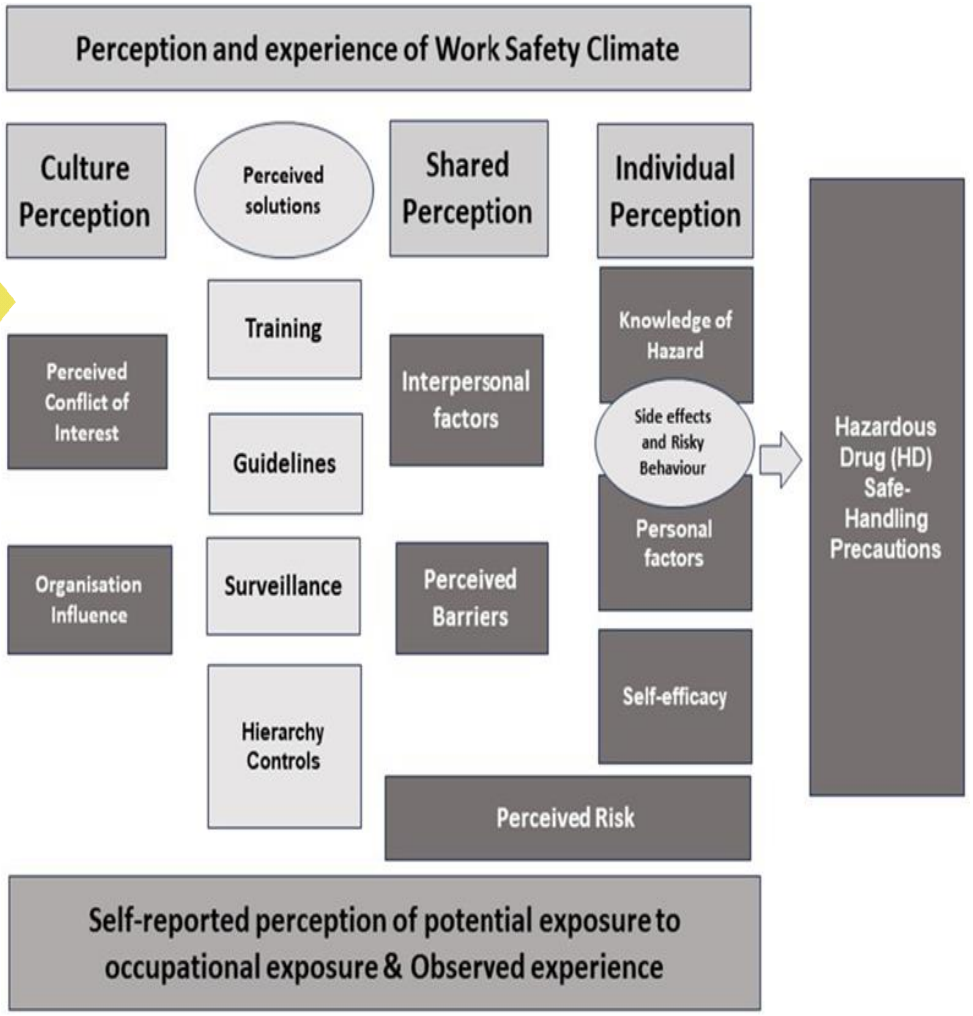
Patterns of categories

- Area of interest mainly studied through surveys in different countries and different populations (24/38 studies)
- Global representation with Thailand and Turkey researching the most in the last 5 years
- Global side effects data (15/38)
- The framework is the most used theoretical underpinning(6/38)

Interpretation of main findings:

- **Three different levels** and not just at Individual responsibility; cultural, shared and individual.
- **Self-reported** mainly espoused – what should happen
- **Globally Perception and Experience** are not always equal when talking about potential exposure
- **Observation studies** shows that no matter what the level of knowledge is the chaos of the working environment changes the use of PPE.
- **Side effect papers** are showing similar patterns across the globe.

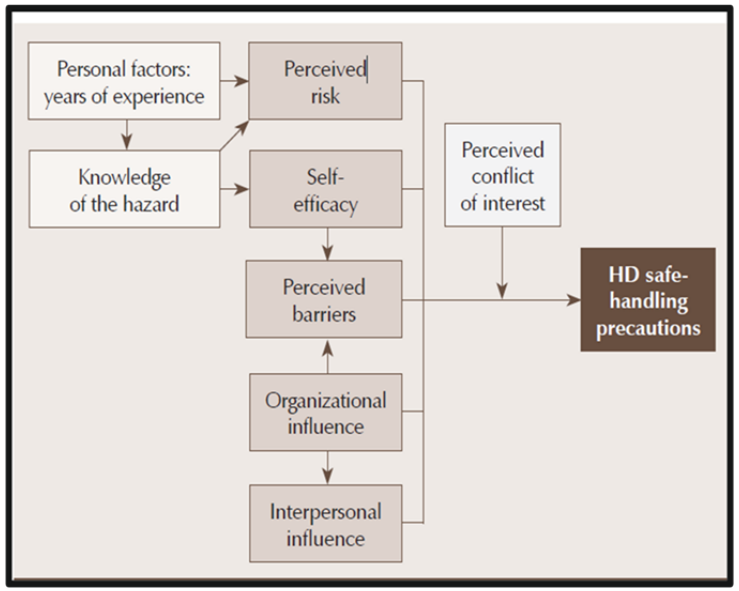

Personal factors: years of experience
Perceived risk
Knowledge of the hazard
Self-efficacy
Perceived conflict of interest
Perceived barriers
HD safe-handling precautions
Organizational influence
Interpersonal influence


Perception and experience of Work Safety Climate
Culture Perception
Perceived solutions
Shared Perception
Individual Perception
Perceived Conflict of Interest
Training
Interpersonal factors
Knowledge of Hazard
Guidelines
Side effects and Risky Behaviour
Organisation Influence
Surveillance
Perceived Barriers
Personal factors
Hierarchy Controls
Self-efficacy
Perceived Risk
Hazardous Drug (HD) Safe-Handling Precautions
Self-reported perception of potential exposure to occupational exposure & Observed experience

Quantitative Methodology

Framework Synthesis:

- Survey (*Polovich & Clarke 2012*)
- Recruitment: UKONS membership
- Criteria – administering chemotherapy
- Asked if they wanted to participate in interviews (N=120)



Participants

Female	621
Male	45
Undisclosed	9
Total Participants	675

Ethical approval was through Edinburgh Napier University

Factors Predicting Use of Hazardous Drug Safe-Handling Precautions Questionnaire

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Predictor Variables	Description	Sample Question	Number of items	Response question
Knowledge of hazard	Knowledge about chemotherapy exposure and usage of PPE	Chemotherapy can enter the body by breathing it in	12	True, False, don't know
Self-Efficacy	Confidence in using the PPE	I am confident that I can use PPE properly	7	Four-point scale from strongly agree to strongly disagree
Perceived Barriers	Address the need for and efficacy. of PPE, time for use, and other physical and emotional discomfort hindrances to wearing PPE	I don't think PPE is necessary	13	Four-point scale from strongly agree to strongly disagree
Perceived risks	Seriousness of the occupational exposure for one's health, probability of current and future harm to oneself, and one's risk in relation to coworkers	Exposure to chemotherapy is a serious problem at work	7	Four-point scale from strongly agree to strongly disagree
Interpersonal influence	How often do coworkers use PPE and how important the respondent feels the use of PPE is for coworkers	How often do the following people wear personal protective equipment when handling chemotherapy?	7	Four-point scale from strongly agree to strongly disagree
Perceived Conflict of Interest	How PPE use might be affected by a workers' ability to protect themselves and provide patient care	Wearing personal protective equipment makes my patients worry	6	Four-point scale from strongly agree to strongly disagree
Work safety climate	Accessibility of PPE, how safety is assessed by managers, training, the cleanliness of the workplace, coworker support, and safety policy	Gloves for chemotherapy are readily accessible in my work area	21	Five-point scale, from strongly agree to strongly disagree (Includes neutral)

Results: Descriptive Statistics for Theoretical Predictor Variables (N =675)

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Variable Name	N	Mean	S.D	Range		Results from survey	Meaning
				Observed	Possible		
Knowledge	675	10.4	1.37	4-12	0-12	Survey results indicate **higher knowledge** amongst the Nurses	Higher score indicate higher Knowledge
Self-efficacy	675	22.3	3.72	11-28	7-28	Survey results indicate **higher self-efficacy** amongst the Nurses	Higher score indicate higher Self-efficacy
Perceived barriers	675	20.3	5.62	13-43	13-52	Survey results indicate **low perceived barriers** amongst the Nurses	Higher score indicate higher perceived barriers
Perceived risks	675	2.8	0.34	1.7-4	1-4	Survey results indicate **moderate perceived risks** amongst the Nurses	Higher score indicate higher perceived risks of harm
Interpersonal influence	675	17.7	3.20	1-20	0-20	Survey results indicate **high interpersonal influence**	Higher score indicate a more positive view of coworker's attitude
Conflict of interest	675	8.96	3.05	6-18	6-24	Survey results indicate **low conflict of interest** amongst the Nurses	Higher score indicate higher conflict of interest
Workplace safety climate	675	84.6	14.30	35-105	21-105	Survey results indicate **moderate safety climate in the workplace**	Higher score indicate a better safety climate

Global comparison: Descriptive Statistics for Theoretical Predictor Variables

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Variable Name	N	Mean	S.D	Range Observed	Range Possible	Results from survey	Meaning
Knowledge	675	10.4	1.37	4-12	0-12	Survey results indicate higher knowledge amongst the Nurses	Higher score indicate higher Knowledge
Self-efficacy	675	22.3	3.72	11-28	7-28	Survey results indicate higher self-efficacy amongst the Nurses	Higher score indicate higher Self-efficacy
Perceived barriers	675	20.3	5.62	13-43	13-52	Survey results indicate low perceived barriers amongst the Nurses	Higher score indicate higher perceived barriers
Perceived risks	675	2.8	0.34	1.7-4	1-4	Survey results indicate moderate perceived risks amongst the Nurses	Higher score indicate higher perceived risks of harm
Interpersonal influence	675	17.7	3.20	1-20	0-20	Survey results indicate high interpersonal influence	Higher score indicate a more positive view of coworker's attitude
Conflict of interest	675	8.96	3.05	6-18	6-24	Survey results indicate low conflict of interest amongst the Nurses	Higher score indicate higher conflict of interest
Workplace safety climate	675	84.6	14.30	35-105	21-105	Survey results indicate moderate safety climate in the workplace	Higher score indicate a better safety climate

Thailand 2021

Variables (possible range)	All participants (n = 884)		Nurse (n = 499)		Nurse assistant (n = 385)		p value[b]
	n	Median (Q1, Q3)	n	Median (Q1, Q3)	n	Median (Q1, Q3)	
Knowledge about AD exposure (0–12)	884	10 (8, 11)	499	10 (9, 11)	385	9 (7, 10)	<0.01
Self-efficacy about using PPE when handling AD (6–24)	865	17 (15, 19)	489	17 (15, 19)	376	17 (15, 19)	0.81
Barriers to using PPE (13–52)	841	27 (22, 30)	484	27 (22, 30)	357	27 (22, 31)	0.50
Perceived risk of AD exposure (3–12)	867	10 (9, 12)	494	11 (9, 12)	373	9 (8, 12)	<0.01
Interpersonal influence (0–24)[a]	848	14 (10, 17)	489	14 (10, 17)	359	14 (9, 17)	0.05
Interpersonal influence—Model (0–12)	864	7 (5, 9)	494	8 (6, 9)	370	7 (5, 9)	<0.01
Interpersonal influence—Norm (0–12)	850	8 (4, 8)	489	7 (5, 8)	361	8 (4, 8)	0.89
Conflict of interest about using PPE (6–24)	874	12 (9, 14)	498	12 (9, 13)	376	12 (10, 14)	0.18
Workplace safety climate (21–105)	843	78 (69, 84)	485	76.5 (68, 84)	357	80 (70, 85)	0.01

Jordan 2021

Table 3. Predictors of Chemotherapy Safe-Handling Precaution Use (N = 153)

Predictor	Possible score range	M (SD)[a]
Chemotherapy Exposure Knowledge	0–12	3.55 (2.09)
Self-Efficacy	6–24	19.56 (2.98)
Perceived Barriers	13–52	28.20 (9.82)
Perceived Risk	1–4	3.21 (0.61)
Interpersonal Influence	0–14	13.95 (3.00)
Conflict of Interest	6–24	15.86 (3.53)
Organization Influence/Workplace Safety Climate	21–105	80.31 (13.17)

Note. SD = standard deviation.
[a]Higher score indicates higher level for each category.

USA 2012

Variable	$\bar{X}$	SD	Range Observed	Range Possible	Meaning
Chemotherapy exposure knowledge	10.9	1.07	7–12	0–12	Higher scores indicate higher knowledge.
Self-efficacy for using personal protective equipment	20.8	2.96	12–24	6–24	Higher scores indicate higher self-efficacy.
Perceived barriers	21.94	6.5	13–40	13–52	Higher scores indicate higher perceived barriers.
Perceived risk	3.14	0.58	1.6–4	0–4	Higher scores indicate higher perceived risk of harm.
Interpersonal influence	2.21	0.44	0.5–3	0–3	Higher scores indicate a more positive view of co-workers attitudes.
Conflict of interest	1.83	0.62	1–3.5	1–4	Higher scores indicate higher conflict.
Workplace safety climate	88.39	12.03	60–105	21–105	Higher scores indicate a better safety climate.

- Lower Perceived Barriers
- Lower Conflict of interest
- Lower perceived risk
- Higher workplace safety other than the USA.

Correlation Between Sample Characteristics and theoretical Predictors (N=675)

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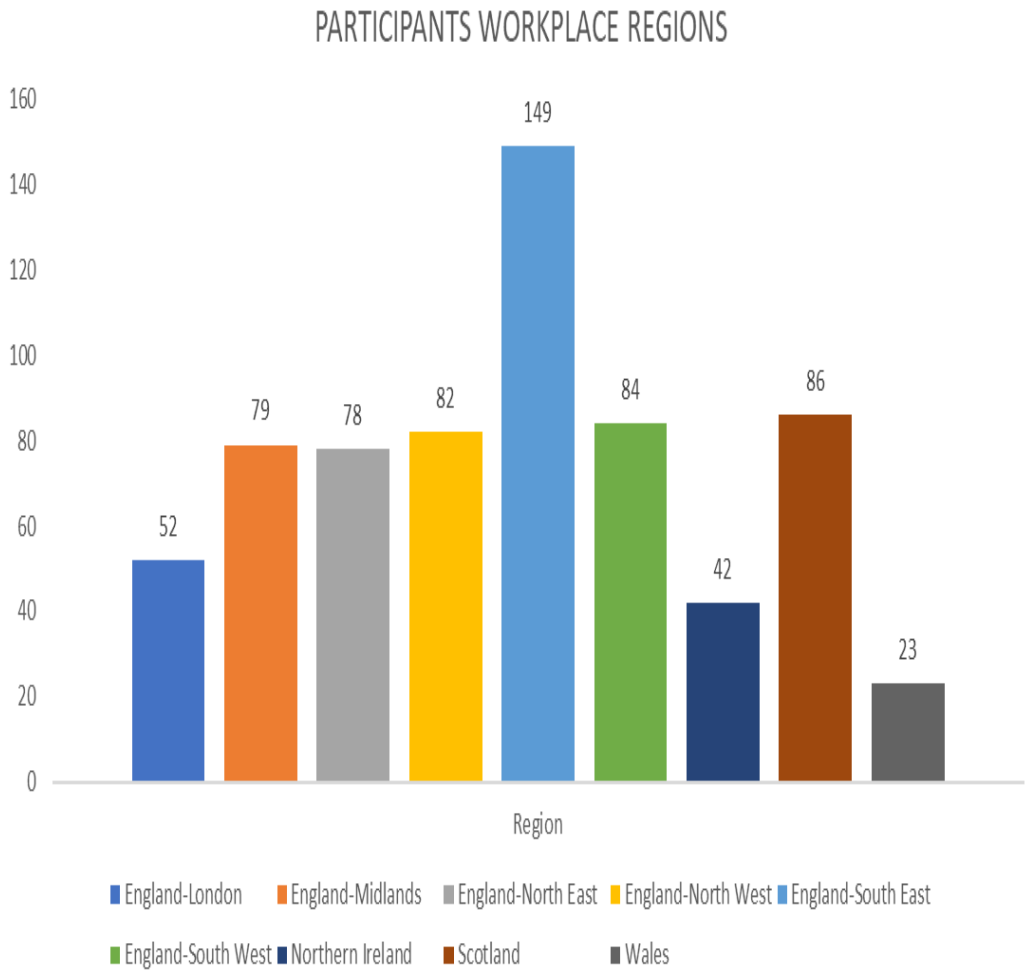
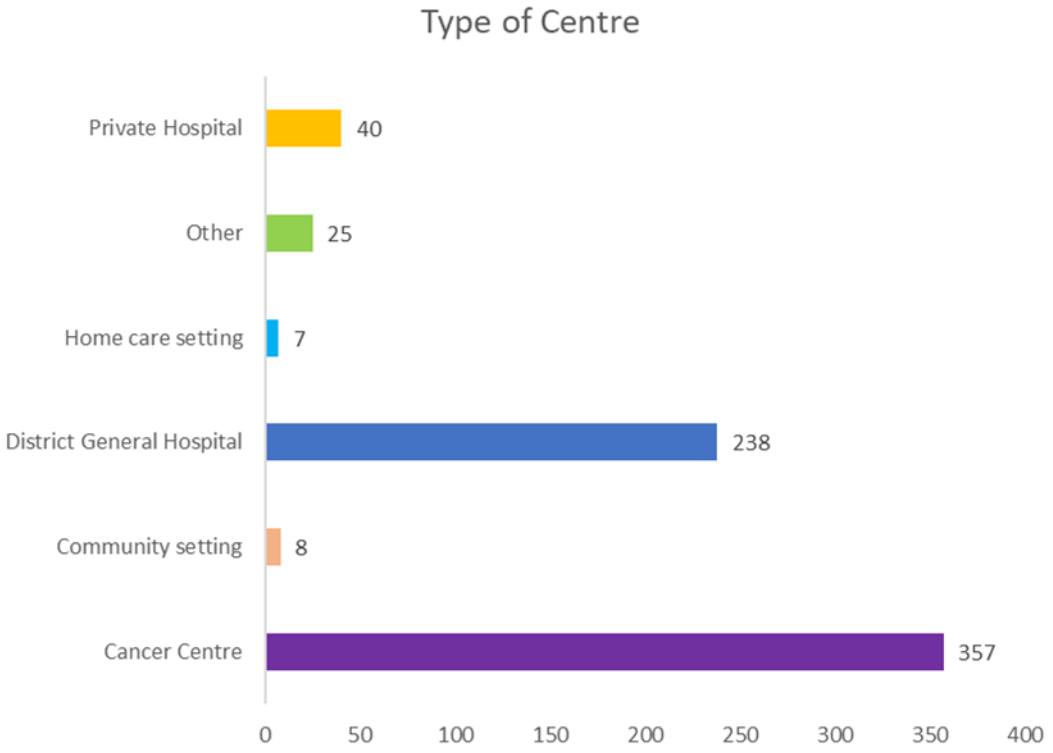
Variable Name	Age (rs)	Years of nursing experience (rs)	Years of oncology experience (rs)	Years of chemotherapy experience (rs)	No of patients treated by the participant per day (rs)
Knowledge	0.093*	0.063	0.052	0.101**	-0.027
Self-efficacy	0.103**	0.133**	0.101**	0.105**	-0.014
Perceived barriers	-0.141**	-0.145**	-0.138**	-0.142**	0.040
Perceived risks	-0.111	-0.057	-0.019	-0.011	0.018
Interpersonal influence	0.068	0.040	0.009	0.001	0.071
Conflict of interest	-0.116**	-0.103**	-0.082*	-0.098*	-0.032
Workplace safety climate	-0.156**	0.171**	0.120**	0.117**	-0.052
Total Safe Handling Precautions Global (N=602) ^ 10 items (Polovich& Clarke 2012)	0.082*	0.085*	0.086*	0.081*	0.050
Total Safe Handling Precautions UK (N=602)^ 6 items	-0.013	-0.012	-0.010	-0.028	0.064
Total Safe Handling Precautions UK (N=602) 13 items with Closed system	.061	.073	.055	.050	.092*
Total Safe Handling Precautions UK (N=602) 12 items without closed system	.051	.057	.041	.035	.112**

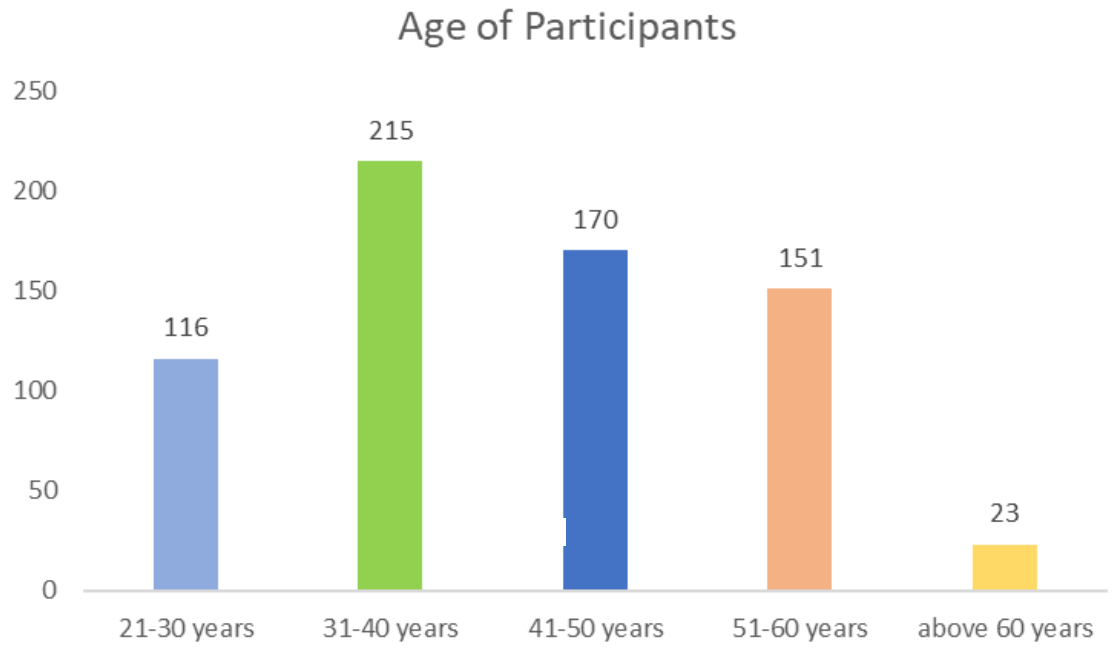
Spearman rank coefficient (rs)
*Correlation is significant at level p < .05.
** Correlation is significant at level p<.01
^ Total safe handling precautions are calculated for 602 participants who have both administered and disposed of the chemotherapy. (Ten items for Global and 6 items for UK)
Safe Handling 13 items (Closed system, chemotherapy gloves, other gloves, chemotherapy gowns, Plastic apron, eye protection, and respirators/masks) new UK scoring
Safe Handling 12 items (chemotherapy gloves, other gloves, chemotherapy gowns, Plastic apron, eye protection, and respirators/masks)
new UK scoring without Closed system

Workplace UK regions

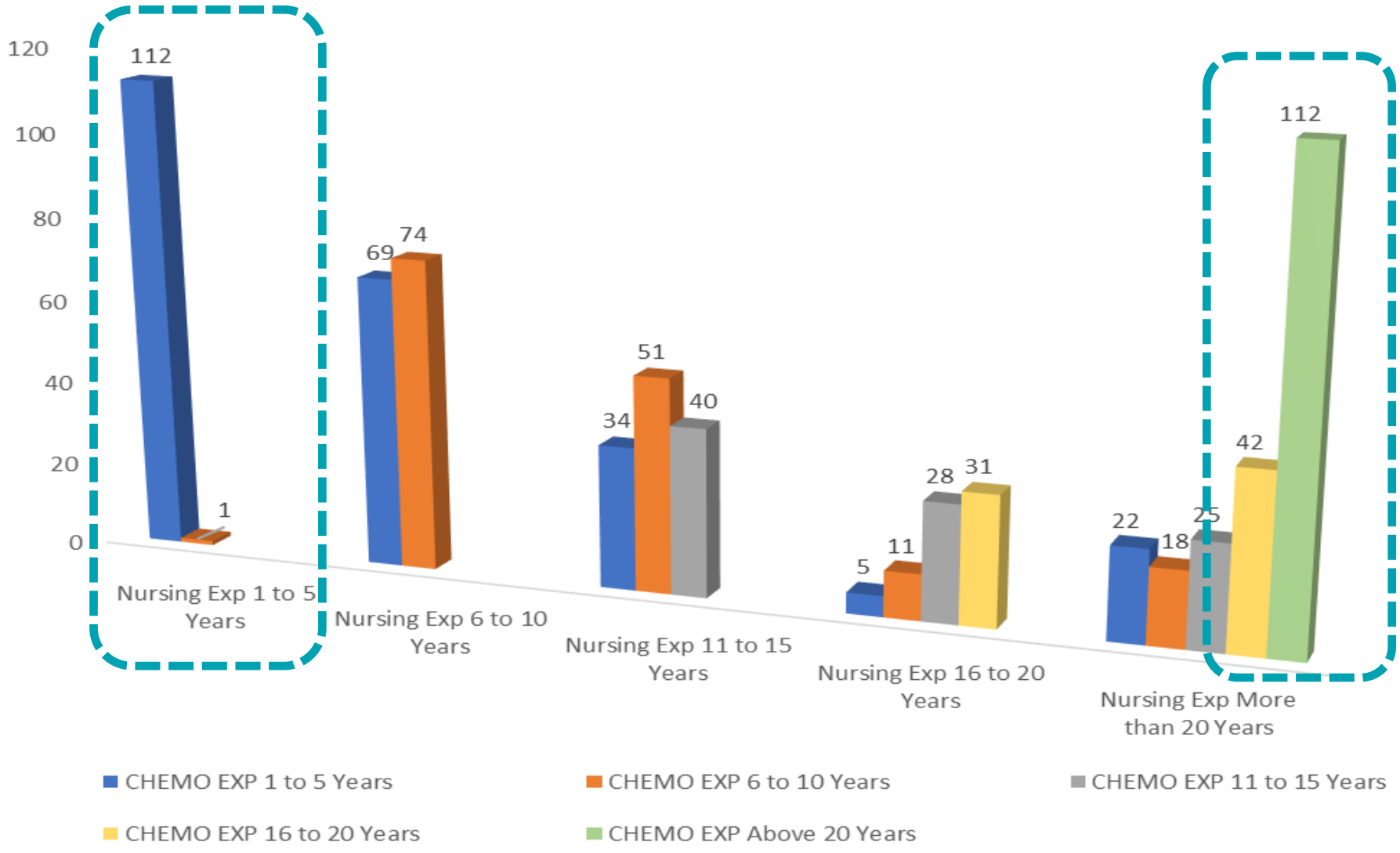




Age of Participants



Nursing experience vs chemohandling experience



Perceived controls to minimise risk

Safe Handling Precautions	*Administration N=747		Disposal N=682		Handling excreta N=502	
	Used n (%)	Never used n (%)	Used n (%)	Never used n (%)	Used n (%)	Never used n (%)
Biosafety cabinet	N/A	N/A	N/A	N/A	N/A	N/A
Closed system	521* (70%)	226* (30%)	N/A			
Gloves labelled for use with chemotherapy	466 (62%)	281(38%)	430 (63%)	252 (37%)	298 (59%)	204 (41%)
other gloves (e.g., vinyl)	393 (53%)	354 (47%)	359 (53%)	323 (47%)	299 (60%)	203 (40%)
Double gloves	110 (15%)	637 (85%)	93 (14%)	589 (86%)	77 (15%)	425 (85%)
Gowns labelled for use with chemotherapy	111 (15%)	636 (85%)	102 (15%)	580 (85%)	56 (11%)	446 (89%)
Plastic aprons*	723 (97%)	24 (3%)	655 (96%)	27 (4%)	492 (98%)	10 (2%)
Re-use Plastic aprons	N/A	N/A	50 (7%)	632 (93%)	17 (3%)	485 (97%)
re-use disposable gloves	N/A	N/A	N/A	N/A	N/A	N/A
eye protection*	320 (43%)	427 (57%)	256 (38%)	426 (62%)	159 (32%)	343 (68%)
Respirator/mask*	380 (51%)	367 (49%)	320 (47%)	362 (53%)	234 (47%)	268 (53%)

Closed Systems Breakdown

Frequency of usage of Closed System N = 747	Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never	Used	Never used
During Administration	325(44%)	95 (13%)	49 (7%)	19 (3%)	33 (4%)	226 (30%)	521 (70%)	226 (30%)

Used—Had experience using the closed system (includes frequency from always, very frequently, occasionally, rarely, very rarely).

Never used- No experience using the closed system (includes only the Never category)

*Failed to ask about the process between pharmacy and storage.
*Failed to ask to what level of thickness of plastic apron.
*Influenced by COVID PPE

Correlation between the theoretical predictors

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Variable Name	Knowledge	Self-efficacy	Perceived barriers	Perceived risks	Interpersonal influence	Conflict of interest	Workplace safety climate
Self-efficacy	-.044						
Perceived barriers	.032	-.453**					
Perceived risks	-.021	-.335**	.265**				
Interpersonal influence	-.078	.242**	-.381	-.153**			
Conflict of interest	-.014	-.289**	.514**	.303**	-.260**		
Workplace safety climate	-.047	.676**	-.556**	-.333**	.301**	-.400**	
Total Safe Handling Precautions(Global)(N=602) ^	-.015	.030	-.043	-.062	.055	-.024	.007
Total Safe Handling Precautions (UK) (N=602)^	-.065	.051	-.051	-.035	.028	-.001	.070
Total Safe Handling Precautions UK (N=602) 13 items with Closed system	-.061	.049	-.077	-.066	.085*	-.045	.031
Total Safe Handling Precautions UK (N=602) 12 items without closed system	-.077	.056	-.096*	-.067	.090*	-.050	.039

Spearman rank coefficient (rs)
*Correlation is significant at level p < .05.
** Correlation is significant at level p<.01
^ Total safe handling precautions are calculated for 602 participants who have both administered and disposed of the chemotherapy.
Safe Handling 13 items (Closed system, chemotherapy gloves, other gloves, chemotherapy gowns, Plastic apron, eye protection, and respirators/masks) new UK scoring
Safe Handling 12 items (chemotherapy gloves, other gloves, chemotherapy gowns, Plastic apron, eye protection, and respirators/masks) new UK scoring without Closed system

Safe Handling Precautions	Preparation N=97	
	Used n (%)	Never used n (%)
Biosafety cabinet	8 (8%)	89 (92%)
Closed system	71* (73%)	26* (27%)
Gloves labelled for use with chemotherapy	51 (53%)	46 (47%)
other gloves (e.g., vinyl)	47 (48%)	50 (52%)
Double gloves	19 (20%)	78 (80%)
Gowns labelled for use with chemotherapy	18 (19%)	79 (81%)
Plastic aprons	N/A	N/A
Re-use Plastic aprons	N/A	N/A
re-use disposable gloves	14 (14%)	83 (86%)
eye protection	45 (46%)	52 (54%)
Respirator/mask	51 (53%)	46 (47%)

- We are expected to prepare MAbs on the ward with minimal protective equipment.
- We only use closed systems for preparing MABS and not administering. Lots of push back from management about the cost of closed systems

Received: 24 November 2022 | Accepted: 17 January 2023 | Published on: 10 March 2023
DOI: 10.1111/ajco.13943

ORIGINAL ARTICLE

WILEY

Clinical Oncology Society of Australia Position Statement: 2022 update to the safe handling of monoclonal antibodies in healthcare settings

Marissa Ryan[1,2,3] | Neil Lam[4] | Kate Wright[5,6] | Jim Siderov[7]

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Seminars in Oncology Nursing 000 (2025) 151817

Contents lists available at ScienceDirect

Seminars in Oncology Nursing

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Predictor Factors Associated With Hazardous Drug Safe Handling Precautions Across a UK Oncology Nurse Sample and Implications for Novel Treatments

Karen Campbell[a,*], Daniel Dicksit[a], Martha Polovich[b]

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[b] University of Maryland School of Medicine, Baltimore, MD

A B S T R A C T

Objectives: The development and use of novel systemic anticancer therapy (SACT) treatments are advancing rapidly. While cytotoxic drugs have traditionally been the cornerstone of treatment, they are increasingly used alongside novel agents. This study aims to assess factors affecting adherence to safe-handling precautions, enhance safety protocols, and minimize potential occupational exposure to hazards in clinical environments, increasing their capacity for novel treatments.

Methods: Cross-sectional, online survey of oncology nurses across the UK who handled SACT. Participants were asked to complete the *Factors Predicting Use of Hazardous Drug Safe-Handling Precautions* Questionnaire. Descriptive analysis, Spearman rank correlation coefficients, and regression analysis were performed to determine the predictors of precautionary use when handling HDs.

Findings: Analysis of (n = 675) participants revealed high knowledge of exposure, high self-efficacy, low perceived barriers, moderate perceived risks, high interpersonal influence, low conflict of interest and moderate safety climate in the workplace. The analysis of the data also indicated weak positive correlations between age and knowledge (rs = 0.093), self-efficacy (rs = 0.103) and safe-handling scores (rs = 0.082); the age of the participants has a weak negative correlation to perceived barriers (rs = −0.141), conflict of interest (rs = −0.116), and workplace safety climate(rs = −0.116). Notably, safe handling scores showed no significant correlation with other theoretical predictors. Comparison between government and private sector nurses (n = 76) demonstrated higher patient volumes F (15.807, 74), $P < .001$ and significantly lower safe handling scores in the government settings F (4.135, 74) $P < .05$.

Conclusions: Nurse-patient ratios between government and private sector settings predict global safe-handling precautions.

Implications for practice: Novel treatments for nurse-patient ratios are essential, as new therapies and schedules further create additional workload pressures that may reduce safe handling practices.

Conclusion

This survey, conducted across the UK, highlighted different private and governmental practices regarding PPE requirements and patient workload. The survey indirectly identified a minimum standard of PPE requirement for administering and disposing of CDs. This survey has also indirectly identified that units are preparing SACT drugs (i.e. novel treatments), with an inconsistent utilization of biosafety cabinets and CSTDs, eye protection and masks. Overall, the UK has a moderate workplace safety climate, partially supported by an individual's self-efficacy and co-worker trust. However, the complexity could also be associated with high patient volume and workload. None of the predictive factors translated into safe handling practices except co-worker trust. There is an indication that participants felt knowledgeable about the hazards of administering SACT but were unclear and anxious about the implementation of preparing and administration of novel drugs in light of limited guidance and standardization of PPE.

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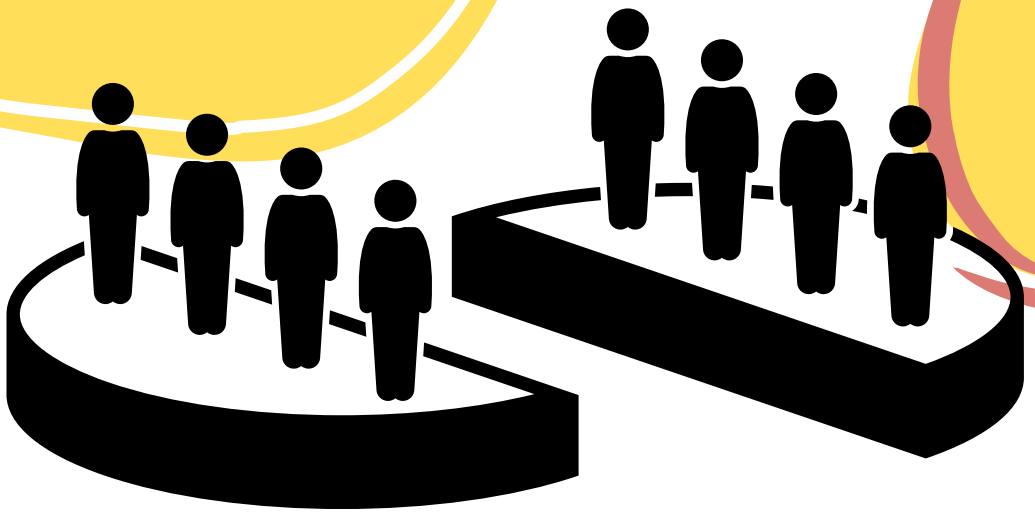
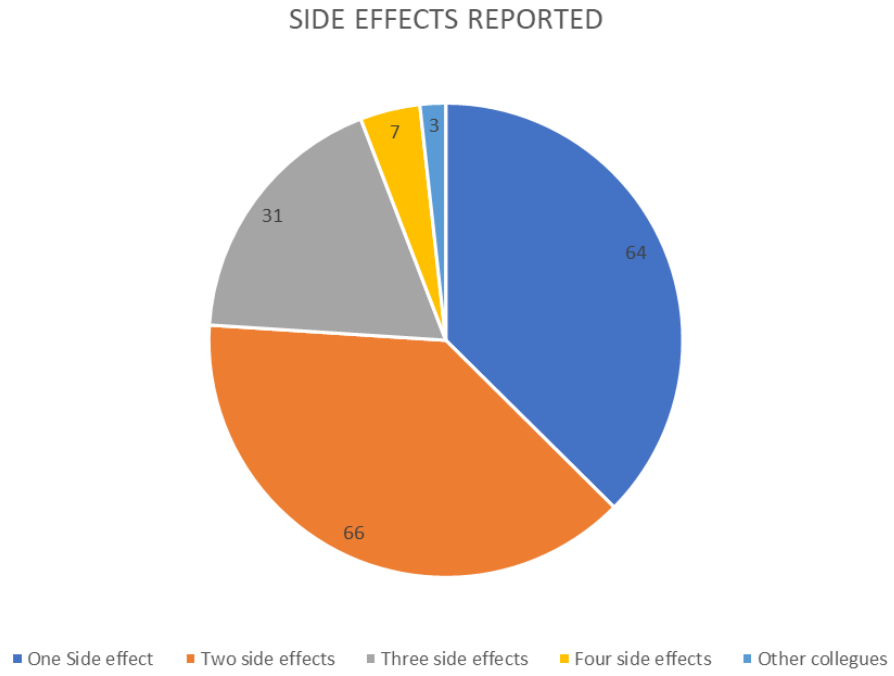
some of your questions are leading and seeking to create a problem where none exists



I don't think this survey takes into account that My health board uses/supplies/trains PPE correctly, but I think its below par. UK standard for PPE isn't the same as other international standards. I was trained overseas and PPE requirements where very specific and defined at a government level. PPE for SACT use in the UK is vague and leaves it up to interpretation by each institution..... I find the PPE standards here are lower and don't take into account exposure to the occupational area and cross contamination. I perceive that there is a lack of understanding to how much cytotoxic exposure is in the occupation area. I also don't think health boards are aware of the all the contamination caused.

Health effects arranged as per frequency (HIGHEST – LOWEST)

Condition	Frequency
Headaches	46
Hair loss	23
Eye irritation/sore eyes	16
Fatigue	12
Skin irritation/changes/dryness/itchiness/sore	12
Altered taste	11
Hair thinning	11
Nausea	10
Dizziness	9
Nasal irritation	7
Miscarriage	6
Smell of Chemo drugs	6
Dry skin	5
Low blood count/Immune/Neutrophils	5



Health Effects	Quotes
Excessive sickness	• “I was having repeated **chest infections**, sore throats”.
Hair loss	• “Lot of us lose our hair a lot” • “I've found **significant hair loss**”. • “Everyone gets hair loss”.
Bolusing	• “Colleagues that have felt like **lightheaded maybe headaches**”. • “That I would get a headache”
Perception of Cause	• “There is an occupational risk of handling cytotoxic drugs as well as sort of monoclonal antibodies.” • “We're definitely **giving a wider variety of types** of hazardous drugs Which will risk me” • “All the kind of anti-cancer drugs you know**, they're designed to kill cancer.** So, you'd probably not gonna wanna be exposed to them unless you've got cancer” • “**Changing job lessened my symptoms”**
No health-effects	• “No, I would say like, **I do feel fairly safe working with it**” • “I don't think physically speaking I've experienced anything.” • ”I haven't **noticed any issues.** I've been pregnant twice. Whilst giving treatment and those babies both went to term were both above average birth weight,” • “Don't think it's had an effect on my health that I know” • “I don't, thankfully.” • “No, because I've always **felt quite safe at work”** • “No, I don't think anything's any different.”
Disbelief	• “It's difficult to know” “**scaremongering being going around**”. • “But actually, somebody handling the chemotherapy, **there is no clear evidence”**

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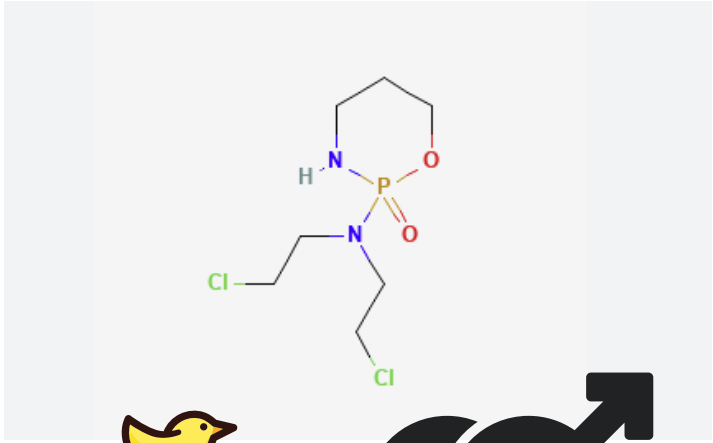
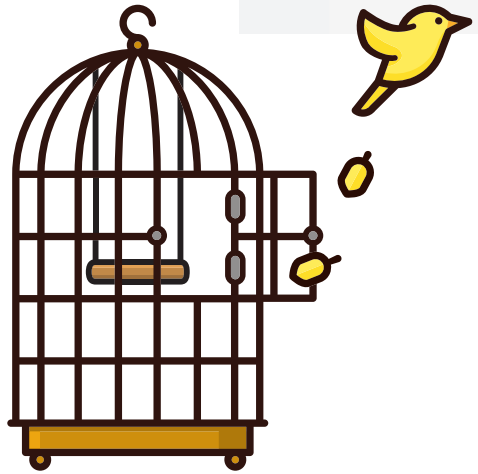
No, I haven't. And I do have colleagues that have, you know, felt symptoms and have been giving chemotherapy, but that's not something ever happened to me....

That's I guess my sort of concerns were when I was I gave the treatment when I was pregnant and expecting my sons....Weren't supposed to be bolusing the chemotherapy, but we were still hanging Infusional chemotherapy..... It's not when we're doing the Infusional chemotherapy. It's more being when they're giving the bolus treatments and have colleagues that have felt like, uh, like lightheaded maybe headaches.

More specifically, when it's a certain drug called cyclophosphamide that seems to be the one that seems to affect most people well, not most people, but people that are affected, that seems to be the drug that is uhm, that's most commonly giving them those effects. But sort of headaches...Lightheaded. Some people get, like, a funny taste in their mouth when they've been giving it.

So, these are things I've sort of heard from other colleagues, but it's not something that's ever happened to me.





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- Investigation into chemotherapy and pregnancy
- lack of policy around pregnancy in chemo units
- Pregnancy while expected to administer SACT
- Concerns during pregnancy and concerns re effects on fertility

European Journal of Oncology Nursing 70 (2024) 102595

Contents lists available at ScienceDirect

European Journal of Oncology Nursing

journal homepage: www.elsevier.com/locate/ejon

Aspects of occupational safety: a survey among European cancer nurses

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META-ANALYSIS

NursingOpen Open Access WILEY

Influence of occupational exposure to antineoplastic agents on adverse pregnancy outcomes among nurses: A meta-analysis

Shuhan Liu[1] | Yanshan Huang[2,3] | Hong Huang[1] | Song Hu[2] | Xiao Zhong[2] | Ji Peng[2] | Xiaoming Zhang[4] | Xiaohong Huang[1,2]

Why you should read this article:

- To refresh your knowledge of the risks posed by cytotoxic drugs
- To understand the types of safety measures commonly used by nurses when administering cytotoxic drugs
- To explore whether cancer nurses have an appropriate level of knowledge regarding safety measures such as personal protective equipment

Exploring safe practice when handling cytotoxic drugs: findings from survey of UK cancer nurses

Karen Campbell and Daniel Dicksit

Citation
Campbell K, Dicksit D (2025) Exploring safe practice when handling cytotoxic drugs: findings from a survey of UK cancer nurses. Cancer Nursing Practice. doi: 10.7748/cnp.2025.e1878

Peer review
This article has been subject to external double-blind peer review and checked for plagiarism using automated software

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Conflict of interest
None declared

Accepted
11 December 2024

Published online
March 2025

Acknowledgments
This study was funded by a UK Oncology Nursing Society grant. Thank you to Dr Martha Polovich for the use of the survey

Abstract

Background Cytotoxic drugs, including chemotherapy, potentially pose significant risks to cancer nurses. Therefore, it is important to take measures to protect them from the health effects associated with these drugs.

Aim To determine UK cancer nurses' perceptions and experiences regarding potential exposure to cytotoxic drugs, including their knowledge of hazards, use of personal protective equipment (PPE) and closed system transfer devices (CSTDs), and perceived health effects.

Method A cross-sectional survey was conducted across the UK, facilitated through the UK Oncology Nursing Society. Descriptive analyses were employed.

Results The survey revealed that the PPE predominantly used by respondents when administering cytotoxic drugs were plastic aprons (97%, *n*=723/747) and either gloves labelled for use with chemotherapy (62%, *n*=466/747) or other gloves (53%, *n*=393/747). Around 70% (*n*=521/747) of respondents had used CSTDs during administration. Perceived health effects associated with handling cytotoxic drugs were reported by 161 respondents.

Conclusion This study indicates that most cancer nurses have a high level of knowledge of the hazards of cytotoxic drugs, and that plastic aprons and gloves are the primary protection used against occupational exposure. However, there appear to be variation in their use of CSTDs. Many cancer nurses perceive their health to be compromised due to the handling of cytotoxic drugs. It is recommended that all cancer treatment settings across the UK should implement CSTDs.

Author details

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Keywords

cancer, cancer treatments, chemotherapy, clinical, health and safety, management, medicines, medicines management, occupational health, professional, risk management, workforce

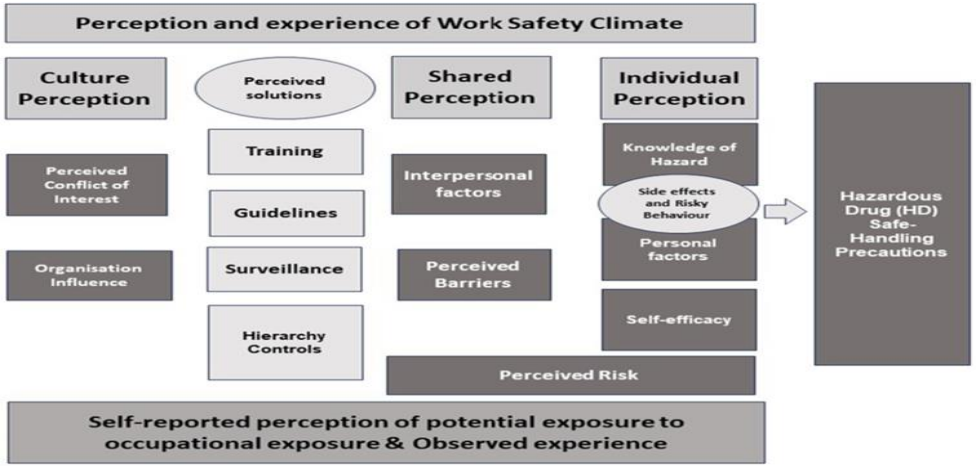
Conclusion

This study reveals that there are variations in practice when handling cytotoxic drugs across the UK, resulting in what could be described as somewhat adequate control and safety in the workplace. Overall, cancer nurses had a high level of knowledge of the hazards associated with these drugs and there was commonality in their use of plastic aprons and gloves for the main PPE. However, there was inconsistent use of CSTDs. Many of the cancer nurses also self-reported perceived health effects from handling cytotoxic drugs. It is recommended that the use of PPE is standardised to ensure it is sufficiently robust, and for the use of CSTDs to be mandatory for hazardous drugs in accordance with European Biosafety Network (2024) guidance.

Qualitative Methodology

Framework Synthesis:

- Deductive & inductive coding was performed by all four individuals in the team. Interviews over teams or telephone and lasted from 20mins to 40 mins.
- Recruitment: UKONS
- Criteria – administering chemotherapy



Participants

Female	28
Male	4
Total Participants	32
NHS England Region	15
NHS Scotland	4
Private Hospitals	4
Not disclosed	9

Ethical approval was through Edinburgh Napier University

Belief system

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ORGANISATIONS

They don't actually care.

They care about how many patients that you can treat and how much you can treat in a day and not actually the welfare of their staff."

CULTURAL PERCEPTION & EXPERIENCE

- Staffing
- Cost
- Closed Transfer Device Systems
- Being valued
- Risk assessment/ auditing

ORGANISATIONS

"I mean that that they're pretty they they're good. I mean they're on board really"

"manager supports purchase when explained about safety"

Cultural Perception

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Findings

- Less protected than global colleagues .
- The UK is similar in health effect profile to global colleagues.
- Lack of consistency in use of closed systems.
- Division in **perception and experience** within the cancer community across the UK.
  - between the hospitals
  - between staff
- Across the UK there is a perception of a moderate-level workplace safety climate.

Shared Perception

Findings

- There is a defined UK NHS PPE provision – apron and gloves!
- There appears to be a defined private hospital PPE provision- gowns, gloves eye and respiratory masks!
- Communities can share health effects OR watch others suffering from side-effects OR be unaware of side effects.
- Across the UK there is a perception that colleagues are safe to work with.

Individual Perception

Findings

- Overall, there is a high level of individual knowledge regarding the process and protocols for minimising the potential risk to occupational exposure. This does not necessarily translate to workplace safety.
- Some individuals may suffer more health-effects than others.
- The survey shows overall individuals display a high level of ‘self-efficacy’ having the ability to influence their workplace safety, but this is felt less in the younger staff with less experience.
- Younger staff with less experience, appear to have more perceived barriers & conflict of interest than older colleagues.

Overall Interpretation

- Different **perception** of the potential for occupational exposure and a different **experience** of practice in administration of cancer treatments.
- **Opposite attitude** as to whether this is a ‘problem’ needing to be solved.
- Cancer community needs to come together and find a **new ‘belief’** system to support everyone working in this field especially the new members to the community.

Contamination & Air sampling Study

Edinburgh Cancer Centre
Western General Hospital

icumedical
human connections

Edinburgh Napier UNIVERSITY

Methodology

- **Surface and air contamination sampling** was performed **three times in a two-month** period with separate inpatient and outpatient observation by a practice educator.
- Pharmacy sampling (surface isolators, bench top, compounded products, bags, and trays)
- The administration unit (transport bags, trays, and trolley arms, gloves, infusion pumps).
- **Air sampling devices were worn by the nurses, all shift.**
- All samples were analysed for cyclophosphamide, 5-fluorouracil, docetaxel, and paclitaxel.
- Liquid chromatography tandem mass spectrometry was used for the analysis of the drugs.
- A steering group was convened working towards positive change and implementation of safety measures.

Pharmacy Results - Wipe sampling

Table 1. Contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) on the outer surface of drug vials (n = 4) (ng/cm^2).

Trial	Vial type (company)	Surface (cm^2)	5FU	CP	DOC	PAC
1	5FU 5000 mg/100 ml sealed and bottom protection (Accord)	672	ND	ND	ND	ND
	CP 1000 mg (Sandoz)	580	ND	ND	ND	ND
	PAC 30 mg/5 ml sealed and bottom protection (Fresenius Kabi)	116	ND	ND	ND	ND
	DOC 80 mg/4 ml (Hikma)	104	ND	ND	ND	ND
2	5FU 5000 mg/100 ml sealed and bottom protection (Accord)	672	ND	ND	ND	ND
	CP 500 mg (Sandoz)	372	ND	ND	ND	ND
	PAC 150 mg/25 ml sealed and bottom protection (Fresenius Kabi)	384	ND	ND	ND	ND
	DOC 80 mg/4 ml (Hikma)	104	ND	ND	ND	ND
3	5FU 500 mg/10 ml sealed and bottom protection (Accord)	104	ND	ND	ND	ND
	CP 500 mg (Sandoz)	372	ND	ND	ND	ND
	PAC 30 mg/5 ml sealed and bottom protection (Fresenius Kabi)	116	ND	ND	ND	2.1
	DOC 80 mg/4 ml (Hikma)	104	ND	ND	ND	ND

ND: Not Detected.

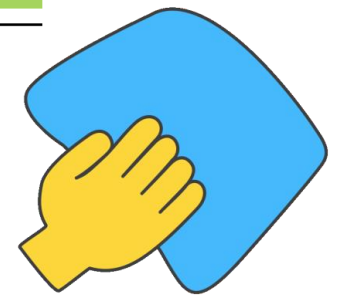
Table 2. Surface contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) on outsourced compounded syringes and infusion bags[a] (ng/cm^2).

Trial	Description surface	Surface (cm^2)	5FU	CP	DOC	PAC
1[b]	50 ml syringes 5FU 900 mg/36 ml (n = 4) (Bathasu)	468	ND	ND	ND	ND
	50 ml syringes CP 550 mg/27.5 ml (n = 4) (Bathasu)	468	ND	7.6	ND	ND
	250 ml infusion bags PAC 240 mg/290 ml (n = 4) (Baxter Prefilled)	1408	ND	ND	ND	ND
2	50 ml syringes 5FU 650 mg/26 ml (n = 4) (Bathasu)	468	ND	ND	ND	ND
	50 ml syringes CP 1000 mg/50 ml (n = 4) (Bathasu)	468	ND	1.1	ND	ND
	250 ml infusion bags PAC 240 mg/290 ml (n = 4) (Baxter Prefilled)	1728	ND	ND	ND	ND
	250 ml infusion bags DOC 160 mg/258 ml (n = 4) (Baxter Prefilled)	1728	ND	ND	0.07	ND
3	30 ml syringes 5FU 500 mg/20 ml (n = 4) (Bathasu)	316	0.52	ND	ND	ND
	50 ml syringes CP 900 mg/45 ml (n = 1) and 550 mg/27.5 ml (n = 1) (Bathasu)[c]	246	ND	2.3	ND	ND
	250 ml infusion bags PAC 216 mg/286 ml (n = 3) and 174 mg/279 ml (n = 1) (Baxter Prefilled)	1728	ND	ND	ND	ND
	250 ml infusion bags DOC 150 mg/257.5 ml (n = 1) and 200 mg/272 ml (n = 3) (Baxter Prefilled)	1728	ND	ND	0.35	ND

ND: Not Detected.
[a]Outsourced compounded drugs: DOC and PAC only available in infusion bags and 5FU and CP only available in syringes.
[b]DOC infusion bags temporarily not available.
[c]Only two syringes CP available.

Table 3. Surface contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) on bench top and on working surfaces in the isolators in the compounding department (ng/cm^2).

Trial	Description surface	Surface (cm^2)	5FU	CP	DOC	PAC
1	Bench top	4000	20	3.6	ND	ND
	Isolator 1	6136	2.4	2.4	ND	ND
	Isolator 3	6136	11	1.4	ND	ND
2	Bench top	4000	7.3	1.1	0.02	ND
	Isolator 4	6136	0.67	21	ND	ND
	Isolator 3	6136	17	0.09	0.01	ND
3	Bench top	4000	2.1	11	ND	0.07
	Isolator 1	6136	5.7	1.8	ND	ND
	Isolator 2	6136	8.3	18	ND	0.06
	Isolator 3	6136	21	2.4	ND	ND

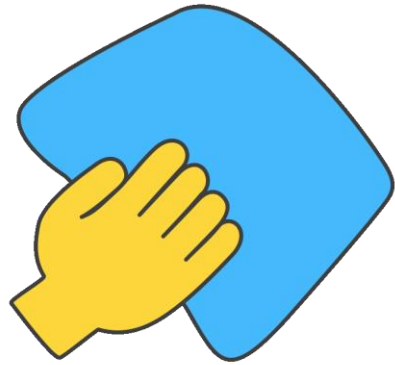


Pharmacy Results - Wipe Sampling

Table 4. Surface contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) on compounded products (syringes, infusion bags and elastomeric pumps), clear outer bags, and yellow trays in the compounding department (ng/cm^2).

Trial	Set	Description surface	Surface (cm^2)	5FU	CP	DOC	PAC
1	1	Syringe 5FU 650 mg, Elastomeric pump 5FU 5600 mg, Infusion bag DOC 96 mg, Infusion bag DOC 80 mg	1103	2.4	ND	ND	ND
		Clear outer bags (n = 4)	3542	6.1	ND	ND	ND
		Yellow trays after preparation (n = 4)	4904	855	0.70	ND	ND
2	2	Infusion bag PAC 129 mg, Infusion bag PAC 75 mg, Infusion bag PAC 390 mg, Infusion bags 5FU 2000 mg (n = 2)	2916	75	ND	ND	ND
		Clear outer bags (n = 5)	5014	0.61	ND	ND	ND
		Yellow trays after preparation (n = 4)	4904	33	ND	ND	ND
	3	Elastomeric pump 5FU 4100 mg, Infusion bag PAC 156 mg, Infusion bag DOC 160 mg, Syringes 5FU 650 mg (n = 4), Syringes CP 700 mg (n = 2)	1688	0.36	8.6	ND	ND
		Clear outer bags (n = 5)	6548	ND	0.16	ND	ND
		Yellow trays after preparation (n = 5)	6130	ND	0.53	ND	ND
3	4	Syringes CP 700 mg (n = 2), Elastomeric pump 5FU 4450 mg, Infusion bag PAC 294 mg, Infusion bag DOC 150 mg	1220	1.2	48	ND	1.6
		Clear outer bags (n = 4)	3542	ND	3.1	ND	ND
		Yellow trays after preparation (n = 4)	4904	1.2	17	ND	0.87
	5	Syringes CP 650 mg (n = 2), Elastomeric pump 5FU 3300 mg, Syringe 5FU 450 mg, Elastomeric pump 5FU 2750 mg	691	8.3	69	ND	ND
		Clear outer bags (n = 3)[a]	2852	ND	0.18	ND	ND
		Yellow trays after preparation (n = 4)	4904	0.85	6.3	ND	ND
	6	Elastomeric pump 5FU 4100 mg, Infusion bag PAC 141 mg, Syringes CP 600 mg (n = 2), Infusion bag DOC 108 mg	1220	2.1	90	ND	0.28
		Clear outer bags (n = 4)	3542	0.02	4.1	ND	ND
		Yellow trays after preparation (n = 4)	4904	0.67	9.1	ND	0.05

ND: Not Detected.
[a]One clear outer bag missing (not sampled) due to wrong dose in syringes (discarded).

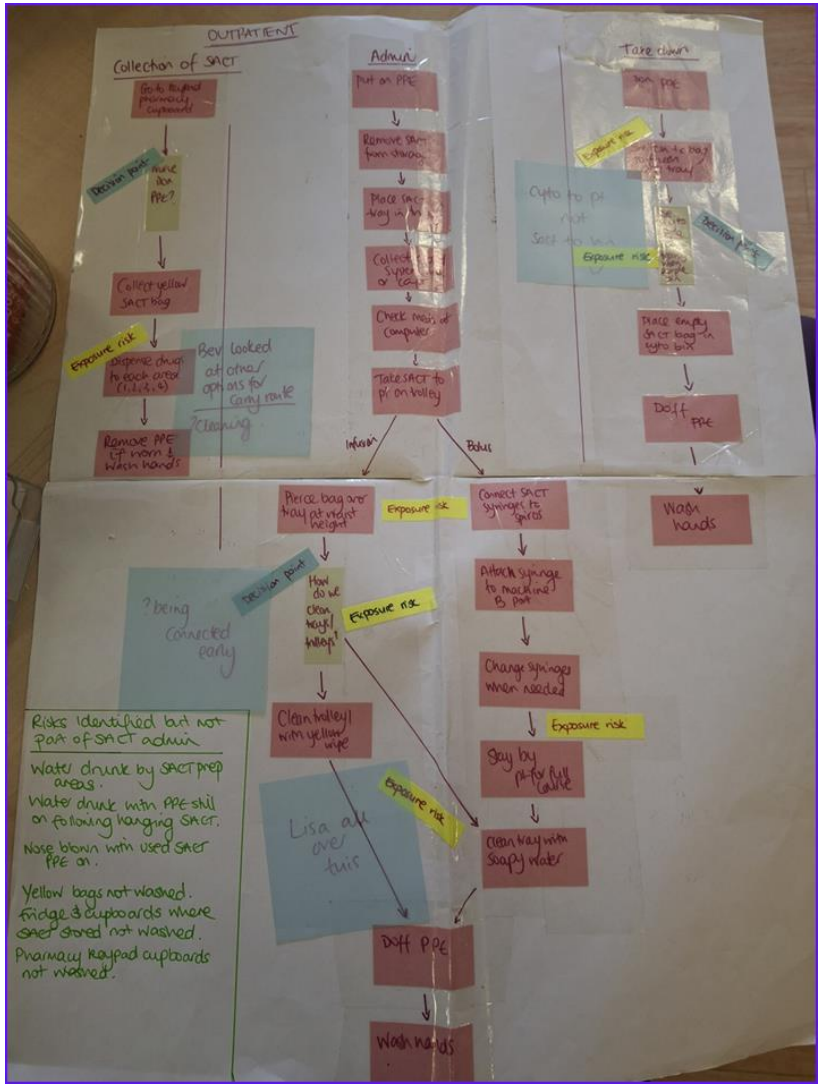


Pharmacy Results - Wipe Sampling

Surface contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) inside yellow bags, on trays at start and after administration, on trolley arms, and on gloves worn by the nurses during administration of the drugs.

Day	Set	Description surface and gloves	Surface (cm²)	Contamination (ng/cm²) 5FU	CP	DOC	PAC
1	1						
		Trolleys arms (n=4)	2400	ND	0.03	ND	ND
	2						
		Trays after administration (n=3)	3039	[redacted]		ND	ND
		Trolleys arms (n=3)	1800	ND	[redacted]	ND	ND
		Gloves Baxter pump 5FU 3500 mg (nurse C)*	1250	[redacted]	ND	ND	ND
	Yellow bags (n=4)	Inside yellow bags containing PAC (n=3) and 5FU (n=1)	11520	0.34	0.01	ND	ND
2	3						
		Trolleys arms (n=4)	2400	0.26	ND	ND	ND
		Gloves bag DOC 150 mg (nurse B)	1250	ND	ND	0.03	ND
	Yellow bags (n=4)	Inside yellow bags containing PAC (n=3), DOC (n=1), 5FU (n=2) and CP (n=1)	11520	0.38	ND	ND	ND
3	5						
		Trolleys arms (n=4)	2400	0.04	ND	ND	ND
		Trays after administration (n=3)	2778	0.16	0.18	ND	ND
		Trolleys arms (n=3)	1800	ND	0.06	ND	ND
		Gloves syringe 5FU 450 mg (nurse C)	1250	0.87	ND	ND	ND
		Gloves Baxter pump 5FU 2750 mg (nurse D)	1250	[redacted]	ND	ND	ND
	7	Trays start (n=4)	3704	ND	0.12	ND	ND
		Trays after administration (n=4)	3704	0.18	0.03	ND	ND
		Trolleys arms (n=4)	2400	3.3	ND	ND	ND
		Gloves 2 syringes CP 600 mg (nurse K)	1250	ND	8.0	ND	ND
		Trays after administration (n=4)	3704	ND	1.0	ND	ND
		Trolleys arms (n=4)	2400	ND	1.1	ND	ND
		Gloves 2 syringes CP 600 mg (nurse L)	1250	ND	3.7	ND	ND
	Yellow bags (n=4)	Inside yellow bags containing PAC (n=1), DOC (n=1) and 5FU (n=2)	11520	0.32	ND	ND	ND
	Control samples	Negative control wipe samples (n=3)		ND	ND	ND	ND
		Negative control gloves (n=3)		ND	ND	ND	ND
		Positive control wipe samples		0.56 mg	0.21 mg	0.52 mg	0.82 mg
		Positive control gloves		0.80 mg	0.07 mg	0.47 mg	0.63 mg

*Gloves accidentally discarded but retrieved from hazardous drug waste bin.
**Gloves 600 mg 5FU syringe and 3500 mg 5FU Baxter pump accidentally discarded in hazardous drug waste bin.
***One tray missed (not sampled).
ND: Not Detected.



Results – Air sampling

Table 6. Environmental air contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) in the compounding department.

Trial	Sampling location	Sampling time (min)	Air concentration[a] (ng/m³)			
			5FU	CP	DOC	PAC
1	Pharmacists A – B	395	ND	ND	ND	ND
	Bench top	420	ND	ND	ND	ND
	Isolator 1	326	ND	ND	ND	ND
	Isolator 3	330	134 (92)	ND	ND	ND
2	Pharmacists A – C – D – E	440	ND	ND	ND	ND
	Bench top	440	ND	ND	ND	ND
	Isolator 4	420	ND	ND	ND	ND
	Isolator 3	445	ND	ND	ND	ND
3	Pharmacists A – D – F – G	620	ND	ND	37 (48)	ND
	Bench top	530	ND	ND	43 (47)	ND
	Isolator 1	480	ND	ND	48 (48)	ND
	Isolator 2	485	ND	ND	49 (50)	ND
	Isolator 3	475	ND	ND	49 (48)	ND

ND: Not Detected.
[a]Values in brackets are the corresponding calculated time-weighted averages over 8 h.

Table 7. Environmental air contamination with 5-fluorouracil (5FU), cyclophosphamide (CP), docetaxel (DOC), and paclitaxel (PAC) in the administration department.

Trial	Nurse	Sampling time (min)	Air concentration (ng/m³)			
			5FU	CP	DOC	PAC
1	A	450	ND	ND	ND	ND
	B	472	ND	ND	ND	ND
	C	460	ND	ND	ND	ND
	D	447	ND	ND	ND	ND
	E	438	ND	ND	ND	ND
	F	260	ND	ND	ND	ND
2	G	448	ND	ND	ND	ND
	C	249	ND	ND	ND	ND
	B	438	ND	ND	ND	ND
	H	472	ND	ND	ND	ND
	I	435	ND	ND	ND	ND
	J	297	ND	ND	ND	ND
3	K	300	ND	ND	ND	ND
	D	278	ND	ND	ND	ND
	C	241	ND	ND	ND	ND
	L	442	ND	ND	ND	ND
	M	421	ND	ND	55 (48)	ND
	N	338	ND	ND	ND	ND
	K	396	ND	ND	ND	ND
	O	416	ND	ND	ND	ND
Control samples	Negative control (n = 3)		ND	ND	ND	ND
	Positive control (mg)		0.14	0.02	0.04	0.24

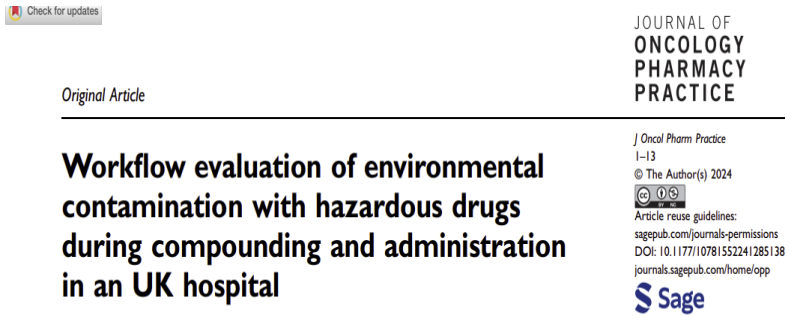
ND: Not Detected.
[a]Value in brackets is the corresponding calculated time-weighted averages over 8 h.

Safety First Group !

- **Awareness of contamination coming through from Pharmacy.**
- **Exploration and implementation of armlets.**
- **Consideration of face-fit masks , goggles and stronger purple aprons across the trust.**

•Observation is effective in identification of nursing occupational exposure.
•The surface and air sampling provided workflow evidence, as well as the current nursing practice.
•Future research will include follow up studies of a) pharmacy after implementation of closed systems and b)implementation of improved PPE.

Results



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Original Article

JOURNAL OF ONCOLOGY PHARMACY PRACTICE

Workflow evaluation of environmental contamination with hazardous drugs during compounding and administration in an UK hospital

Paul JM Sessink[1], Beverley Barry[2], Lisa Dunbar[3], Lisa T Cameron[3], Tessa Kirkness[3] and Karen Campbell[4]

J Oncol Pharm Practice
1–13

DOI: 10.1177/10781552241285138
journals.sagepub.com/home/opp
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Conclusions

The results of the three trials show spread of surface contamination mainly with CP and 5FU in the compounding department. Drug release in the isolators during compounding by using the open needle and syringe technique has resulted in contamination of the compounded syringes, infusion bags, and elastomeric pumps. Contamination is further spread and finally transferred to the administration department. Contamination with DOC and 5FU was also found in environmental air in front of the isolators, above the bench top and around pharmacists and a nurse but the concentrations are all below the OEL. In general, the results show that if contamination starts at the beginning of the workflow (compounding) it will be found on all following stages of the workflow supporting the need of prevention of contamination during compounding.

UKONS

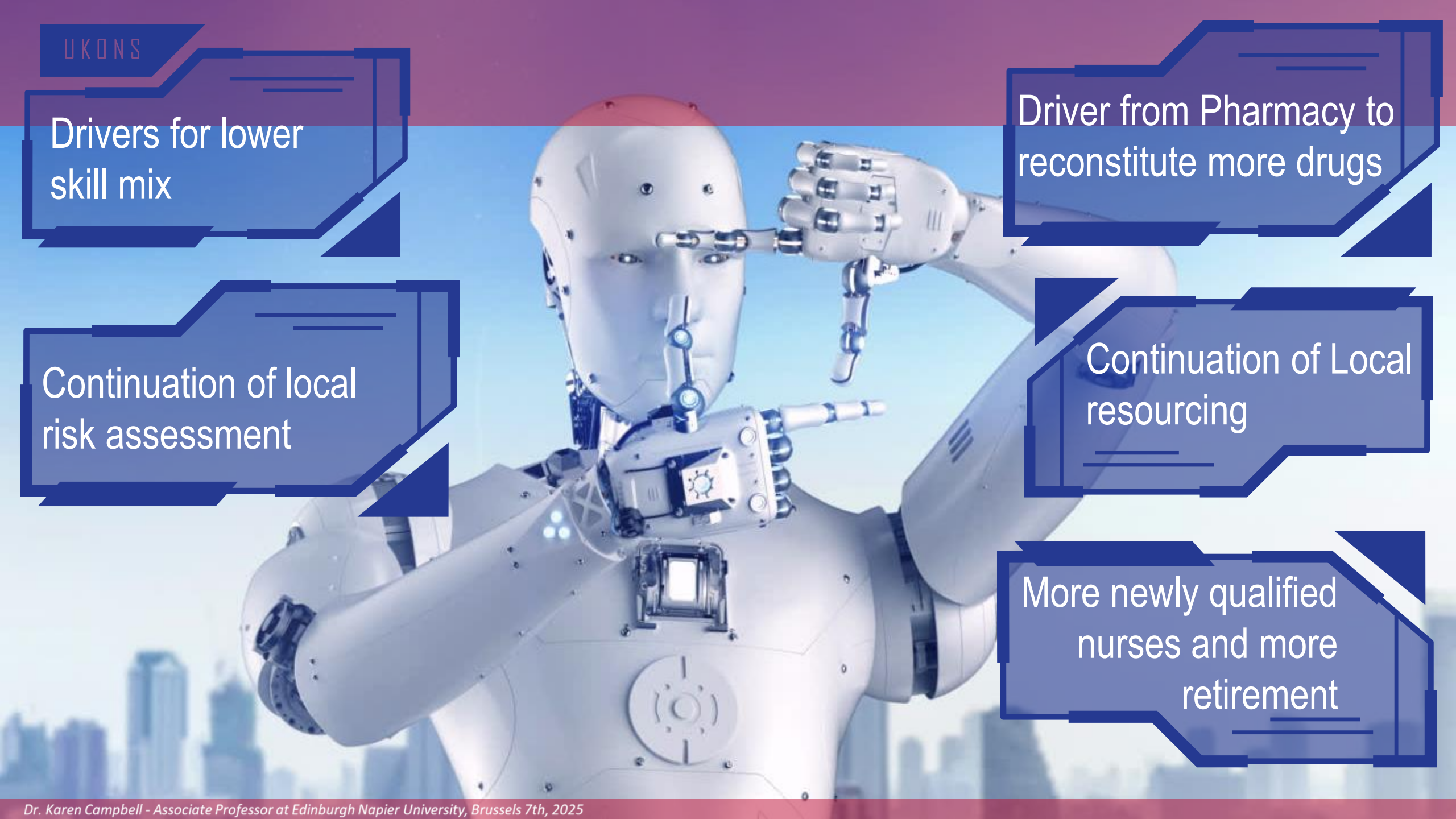
Drivers for lower skill mix

Driver from Pharmacy to reconstitute more drugs

Continuation of local risk assessment

Continuation of Local resourcing

More newly qualified nurses and more retirement



Practicing the legal right to protect every oncology worker

Edinburgh Napier UNIVERSITY

SACT Members Interest Group

SACT Education Network

European Biosafety Network

WHITE PAPER

Preventing contamination, exposure and health impacts for workers from hazardous medicinal products (HMPs) at work by the implementation of closed systems in their manufacture and use

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Health and safety concerns

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Thank you for listening
Questions?

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