CIEHF Pharmaceutical Sector Group

Medical Packaging & Labelling Meeting Birmingham 2019

Venue: The Studio,7 Cannon Street, Birmingham, B2 5EP
Number of Meeting Attendees: 40

Executive Summary:

This is the first CIEHF Pharmaceutical Sector group organised event, where the systems and human factors challenges of labelling and packaging were discussed by a wide-ranging audience across the healthcare and pharmaceutical sectors. There were 40 meeting attendees, and this included meeting delegates; subject matter presenters, and other members of the Sector Group.

Morning presentations included a keynote address from Professor Coleman, University of Birmingham, and a moving and inspiring presentation from Lisa Richards-Everton, a Patient Safety Campaigner. Delegates then participated in a taster workshop looking at challenges around labelling and used the SIEPS 2.0 model to conduct a systems analysis of the management of a patient's condition. The afternoon branched into parallel syndicate workshops with the first workshop focusing on training and education around labelling; what challenges needed addressing with training, and how a human factors approach could optimally start to address these training issues.

The second workshop looked to identify and discuss challenges around the medicine label and how these could be addressed using a human factors approach. This included looking at some of the issues that exist with current labelling design, before discussing what information is necessary and then providing recommendations for the design from a human factor's perspective.

All syndicate groups gave recommendations for next steps to address these challenges, which were shared at the conclusion of the meeting. Several delegates then volunteered to be involved in a steering team, whose remit would be to address the identified challenges by exploring ways in which these system-based recommendations might be implemented.

Recommendations around training perspectives included areas such as Education and communication; System redesign, use of Technology and recommendations about the design of medical packaging with a human factors approach.
Full details of the recommendations can be found in Appendix 6.

Contents of Report

Point of reference for the meeting

Our point of reference for the discussions and recommendations arising from this meeting were based on the International Medication Safety Network's (IMSN) best practice recommendations for safer labelling and packaging from the June 2018 IMSN / FDA Summit. The goals of that meeting were to create a set of best practices for labelling and packaging aimed at reducing medication errors. These objectives were further discussed later that year at the IMSN meeting in Portugal (https://www.intmedsafe.net/). However, some of the specific IMSN recommendations were not addressed at this current meeting in Birmingham but rather will be addressed by the follow-up Working Group. A copy of the IMSN guidelines can be found in Appendix 2 of this report.

The IMSN guidelines were adopted as our reference point in the context of the WHO's Patient Safety Challenge, which is to reduce medication errors by 50%.There is a comparison table between the points raised in this meeting and the IMSN guidelines, for a copy of this please refer to Appendix 7 in this report.

Pre – Meeting Webinar

Prior to the meeting a successful online webinar with 80 attendees was held on the 25th September 2019 called "Blaming the Medicine- is that fair?". It was presented by Dr James Ward and Professor Pete Buckle. During I the webinar they discussed the issues faced by patients found from their research into the problems of medical labelling. Full details of their research can be found in the references section and a link to the webinar can be found below.
Link to online webinar (access for CIEHF members only)

Summary of Meeting Recommendations

A summary of the recommendations for this meeting are included in Appendix 6. In addition, a comparison table of the IMSN recommendations vs. discussions held at the meeting is included in Appendix 7 of this report.

Morning Sessions:

Summary:

Following the Chairman's opening remarks, three sessions were held before lunch. Our first keynote presentation was given by Professor Jamie Coleman from the University of Birmingham. This was followed by a presentation from a patient representative, Lisa Richards–Everton, a Patient Safety Campaigner whose husband died from a medication error. To find out more about the incident please refer to the link below.
Read about Paul's story

The morning session concluded with a taster workshop exploring issues around medicine labelling led by Helen Vosper and Rosemary Lim. If you would like to view the full programme of the day, please refer to Appendix 1 in this report.

Session 1: Opening Remarks- By Brian Edwards

Currently the International Medication Safety Network have released a set of bullet points about the good practice for safe labelling and packaging. This raised questions about how the system will respond and how can these recommendations be implemented by applying what we know about human factors. What sets this meeting In Birmingham apart from previous meetings about labelling is that we are the first who are prioritising a Human Centric systems approach. It is time to stop putting the blame on the label alone but also consider what the system should look like and how we can better design, roll out and monitor the label of a medicine. We all agree that labelling should be the key component for risk minimisation therefore it would be helpful to see how we can optimise the use of the label. On November 4th Colin Knight and Brian Edwards from the CIEHF Pharmaceutical Sector Group will be meeting with some representatives from the Association of British Pharmaceutical Industry (ABPI) as a follow-up to this meeting.

In addition, the Group is also currently in contact with the Medicines & Healthcare Regulatory Agency (MHRA), The International Medication Safety Network (IMSN) and the medication error group in the US Food & Drug Administration (FDA). Output from this meeting will be shared with them.

Session 2: Keynote Presentation: Labelling Challenges from a Clinical Perspective- By Professor Coleman

Professor Coleman began by introducing the challenges faced by prescribers. These include increasingly complex co-morbidities; complex therapies; too much information and too many formats.

The NHS has taken more of an interest in these challenges over the past 20 years. A study by Tim Dornan (2009) 10 years ago showed that 9% of prescriptions contain error, some due to illegibility and some are potentially lethal. Errors can be broken down into the following categories:

Breakdown of errors:

- Administration -50%
- Prescriber - 18%
- Dispensing/ Preparation 16%
- Others -16%

(Cousins, Garrett and Warner, 2012)

The list above also shows the frequency of each category of error. Patients are particularly prone to administration errors as most medicines are self-administering therefore the absolute numbers of errors are likely to be greater.

In 2017, the World Health Organisation set the challenge of reducing medication errors by 50% in 5 years. The initiative was called “Medication without Harm”, in the UK it will be a challenge because how can a 50% level in reduction be measured?

Another challenge is look alike and sound alike drug names, allowing mistakes to easily occur. Strategies to help prevent this include:

- Using a generic name, as more easily recognised
- Adding what the medicine does on the packaging
- Changing the appearance

Why solve a problem when you can prevent it? This includes providing better education for good prescribing practice. National Prescription forms in hospitals would help, however, only Wales are on board with this approach currently.

We should try and encourage inter-professional education. This is about getting people to train together and learn from each other as that is how they will be practicing together. The use of simulations may help them learn. A simulation could include dispensing and administrating medication, where common errors are added in to help them learn.

The national prescribing safety assessment is now in place, which is an examination of prescribing, management of treatment, dosage calculations, monitoring and data interpretation. It is intended to ensure focus will be on high risk medicines. It is an online examination and is sat by every medical student. However, how confident are we this reflects the reality of what people do in practice?

Administration skills are embedded into practical OCSE examinations (Observed Structured Clinical Examinations) with training errors simulated, tis to encourage the students to read the label more cautiously. Humans can cope well with complexity as the brain is good at finding shortcuts so that we can complete tasks as fast as possible. This can lead to problems, as our brains can get confused. Giving more warnings is not the answer and blaming people when it goes wrong will also not help. The SHELL Human Factors model is currently taught to medical students.

An Observed Structured Clinical Examination (OSCE) is an examination designed to assess the ability of a medical professional to apply their professional skills and knowledge in the UK. The test scenarios and questions are relevant to current best practice (University of Northampton, 2019).

In conclusion, there are some potential solutions we could consider when addressing labelling challenges:

- Tallman Lettering- Use of capital and colour for similar drugs.
- Pictograms are useful, which gives a clear and unambiguous warning.
- Simple messages, so that people know what is inside.
- Making information part of the packaging and not the use of stickers, as it can cover up important information.
- Tell patients what they are taking and why they might take it.

There are many solutions, but they are never in one place. Another option is a medicine scanner, which the nurse can put medications on a tray and the machine is able to scan and recognise what each one is. There is currently one being evaluated for this purpose in Newcastle.

Session 3: The Perspective from the Patient Representative - By Lisa Richards-Everton

Lisa introduced her presentation by showing a video she made about the story of what happened to her husband who died from a catastrophic medication error, which is entitled "Pauls Story".

Link to Video Online.

Summary of notes from Video are listed below:

- Incident occurred in 2007.
- Paul had a scan in the afternoon due to temperature fluctuation, they did not give reason why he was starting on a new drug. They were told that it was due to a fungal infection but could not provide further information until Monday as everyone has gone home.
- Paul was taken to a High Dependency Unit shortly after, but the family was not given any information, however, were told that someone else was also given the same drug and is in the same condition.
- Both patients who had taken the drug had both died.
- It was later found that doctor was looking for a British National Formulary (BNF) as there were four formulations of amphotericin, but a BNF could not be found. So, the prescription was written based on the first one that was found without looking at others, which was 325mg which meant 14 vials had to be used to mix it up the drug.
- Paul should have been given 65mg but was given 325mg.
- Lack of support from hospital to Lisa and family after the death.
- Deaths in 2002 and 2003 in US and Canada due to the same issue. The UK was alerted in 2005 as it was an international issue, but the country had not done anything to prevent it.

- After the incident there was a rapid response alert issued by the National Patient Safety Agency, in which all trusts should have complied with it by October 2007. Three Years later, there were trusts that still had not complied with the alert.

Presentation

Amphotericin was the highest risk drug in English Hospital Trusts in 2005. Something could have been done to prevent it. The junior doctor only ever prescribed it once before and was not aware that there are four formulations to it. There was a lack of training and education. And the nurses on the ward failed to notice it even on a senior level when preparing the prescription.

There was a lack of safeguard in place for nurses taking out 14 vials at once. In addition, there was also no reference publication available i.e. BNF available at the time. There was a number the hospital staff could have called but as it was 5:30pm on a Friday there was the feeling of "Home Time". Interestingly, more errors occur at around the 5:30pm time on a Friday than any other time and this is perceived as "home time" for many staff.

Questions

The correct formulation of amphotericin was given, but the dosage guidelines were read and prescribed for a different brand. The prescription should have been based on Paul's weight, but he was not weighed.

It was not a single factor which resulted in Paul's death. He did not have a fungal infection, but rather his symptoms and signs were a result of his chemotherapy. There were multiple contributory factors starting from the top, and a lack of a safety net for identifying these factors which lead to his death. Second checking is confirmation of what has been done rather than identifying the issue as intended. Additionally, there was also a change of consultants during the process.

By the time Lisa got the phone call, the second patient who had taken the same drug had already died, and that patient had reacted to it in the same way. However, hospital staff did not act differently for the treatment with Paul. Patient safety is now part of the curriculum in most medical schools. If it was not for the workarounds that healthcare professionals currently have then these situations could be a lot worst. Another problem is that, if you try to fix one error in the system, you may cause more errors down the line, which we will only find out in many years to come.

Session 4: Taster Workshop: A Human Factors approach to tackling labelling issues- By Helen Vosper and Rosemary Lim

Introduction to Workshop:

It started with a brief introduction to the importance of Human Factors, a systems science. The workshop tied into the afternoon sessions by using examples related to medicine and labelling in a system context.

There is a temptation to get rid of human vulnerability and move towards automation to remove the human from the system. Humans are key to the system not only as patients but ensuring that healthcare occurs safely. How do we maintain safety in the future with automation? One possibility is to adopt some of the features of high reliability organisations. A high reliability organisation is one which we consider to be operating in high risk environments but has a relatively low frequency of adverse events. There has been a recent shift in high reliability organisations from Safety I culture to Safety II. Safety I is when something goes wrong, and we look at why it went wrong and try to find the root cause. Often, such 'root cause analyses' identify someone who 'did something wrong' and the response is to punish or retrain them, with the aim being to achieve behaviour modification. As expected, system failures in high reliability organisations are very infrequent, so more effort should be spent looking at why the system is working right so that we strengthen the characteristics of successful work. So why are we struggling so much with healthcare safety? Reasons include some of the following:

- A critical factor is funding, which not only is limited but also system change is not cheap. It is also likely to involve long-term investment which is incompatible with current healthcare funding cycles.
- The population is aging with clusters of comorbidities. With that comes polypharmacy, some of which is inappropriate.
- Modern medication is becoming increasing powerful, which brings great potential benefit for patients, but also brings with it an increased risk.
- Litigation is also becoming an increasing problem, as increased access to information (as a result of technological advances) has meant that patients are now very aware that not healthcare outcomes are not all necessarily positive.

Healthcare systems are super complex and often borderline chaotic. They are huge constantly organically evolving systems that have rarely been designed systematically. All previous investigations into healthcare "failings" have pointed to systematic failures, and always acknowledged the importance of design.

Medication delivery to the patient is part of a much bigger complex system. The literature recognises this and, out of thousands and thousands of papers on this subject, only 10 attempt a systems approach as it is challenging to consider the system as a whole, and this

is where Human Factors has much to offer. Ergonomics and Human Factors mean the same thing. However, it is worth noting the following:

- That the use of ergonomics over human factors may better imply that we are not only looking at the human but also at all organisational factors concerning the system.
- Ergonomics is a systems approach and is the study of how humans interact with their work environment and use that knowledge to optimise overall system performance while also optimising human wellbeing.
- The key is that it requires a design approach to achieve this.

A problem for safety education is that we learn about patient safety in an isolated way, rather than acquiring the skills to think of patient safety at a systems level. For example: The analogy around drinks from the bar is a good one here. When you carry drinks on a tray do you consider that using a tray is something extra to carry?

If we use Human Factors as just another way of looking at work, then we are not adding to the curriculum but just another way to facilitate their learning.

- Human Factors is design based; it never relies on behaviour modification. Human Factors approaches seek to 'design out' the behaviours you don't want and 'design in' desirable behaviours.

- An example of this which is often quoted is Disney's approach to dealing with injuries sustained by falling from the fence around Princess Aurora's palace. Apparently, parents were sitting their children on the fence in order to take their picture in front of the palace. Falls from the fence happened several times. Using a sign was not considered a solution, it will either be ignored, or it may even challenge people to do it.

    - The design-based solution is to change the shape of the fence so that you cannot sit on it anymore!

However, there also needs to be a systems consideration if parents are keen to get a photo will they find other ways to do so? This links back to Jamie's talk earlier about how changing one thing in the system will affect things further down the system. So, an approach based human factors needs to be iterative so that whenever you implement an intervention you then need to reflect on how your actions affect the wider system.

NHS Scotland has decided that Human Factors is the way forward, so NHS education Scotland are working to put together a "toolbox" of human factors techniques that can be used by non-experts. One of the tools is called the System Engineering initiative for Patient Safety (SEIPS). Benefits of SEIPS includes:

- It allows us to explore the issues that exist in real-life when thinking about safety.
- It is a good way to understand the system of work.

Refer to Appendix 3 in this report to view a template of the SEIPS 2.0 framework and guidelines on how to use it.

We need to be aware of things that will happen now and in the future. It is the quality of the interactions between the entities in the work system that will determine how successful the outcomes are. The principle of this is to use it to understand the good and bad interactions in a system, and then 'design in' the good interactions and 'design out' the bad ones.

High reliability organisations all have one thing in common – that is they employ Human Factors approaches. Healthcare has been keen to learn from these, but we need to be careful that the learning is understood and applied appropriately.

In aviation in the 1970s, safety improved as aircraft design and engine reliability improved. Against this backdrop, it became clear that there were incidents occurring as a result of poor teamworking and communication skills between flight crew. In SEIPS terms, this meant that communication and teamworking were the key 'person factors.' Therefore, in response, crew resource management (CRM) was developed.

The problem for healthcare has been that CRM has been conflated with Human Factors and a lot of money is spent on what we might call 'non-technical skills' training. This has been of great value in certain contexts which echo the flight deck – these include surgical teams. However, as well as being a 'person factor', 'communication' can also be an emergent system outcome. This is often the case in healthcare – communication is poor not because the individuals in the system are poor communicators, but because the system is not designed to support effective communication. Taking a systems approach means not relying on training and education but on design instead.

Taster Workshop

There was an Introduction to the techniques which will be used for the workshop. The aim of the workshop is to consider the management of taking medication safely and effectively. What are the system entities in the case study and what are the interactions to support these? There was a period of between 15-20 minutes to work in groups to complete the assigned tasks. Please refer to Appendix 4 in this report to view the case study information provided for the workshop and Appendix 3 for the SEIPS template used.

Feedback Case Study used for the Workshop:

- There is no supervision, daughter only occasionally visits. (Personal factor of relevance).
- Her vision is not the best so may struggle reading medication.
- Short term memory, she may not remember taking a medication or the instructions for what to take.
- She has arthritis so she may struggle opening the packaging for the medication.

- She maybe struggling to get access to the tablets, so the system must make it as easy as possible to access.

The system needs to empower the user to tell the professional that the medication which they are taking is not having an effect, thus essentially creating a feedback loop. However, due to patient conditions, this might be difficult and therefore you need a system which will monitor it. You will need to consider:

- Other tasks which may involve requesting repeat medication.
- Discussion of potentially moving the medicine into another single container to remove the need to open individual containers each time.
- The need for a consistent pattern for taking medicine, and how the user will remember.

An option here is to educate the user on when to take which medicine and physically arrange medicines to remind them. You need to consider if the person is stable on the medicine? If not, then the strategy used will be different. Routine factors help play a role when getting the user to take medicine, such as taking a specific medicine when they watch a certain TV show.

Our aim is to get the patient to put the medication first, as it is essential for their future well-being. Patients may often take medication for prevention and in those circumstances, they might not understand why they are taking certain medicines, as it does not affect how they feel immediately.

What outcomes do we want? Desirable outcomes for patients and medical professionals may be different which will require understanding why. With a complex system you can never fully model it, but you can share the model to make the system user friendly and understandable.

A limitation of this exercise is that we are only imagining the system, whereas if we were to take an ergonomist approach to this, you will be going into the system and looking at how things work. This is the concept of work as imagined vs. work that is done. You will also be pulling in data from lots of different sources. A key difference between high reliability organisations and healthcare is that data are shared.

Previous studies looked at the human factors underlying use of methotrexate once a week in rheumatoid arthritis as there have been a high number of deaths globally. When looking at the system one of the problems was how the medicine was managed at home.
Blister packs and child resistant containers prevent patients from opening the medicine. Observation showed that people opened the packet and stored the medicine in a different container. This is an example of a work around as many of the patients had arthritis. Child containers require grip strength, and the grip strength decreases with age.

In situations without supervision, patients were getting confused about whether to take the medicine daily or weekly. This is due to the variables of medicine presentation and how the medicine is being used on the patient. For example:

- Information is no longer available as now in a different container.
- The writing on the labels were also found to be too small for people to see.
- Getting confused by the information - due to age and cognitive ability.

Methotrexate is taken with folic acid in order to reduce the side effects, people get confused with how much of which to take.

The Hazard and Operability Analysis (HAZOP) method can be applied to study how a medicine is used in managing high risk scenarios. Three high risk scenarios are all related to packaging are described:

- Confusing strength of medication
- Confusion between methotrexate and folic acid
- Pharmacy demonstrated errors in picking the right medicine due to lookalike packaging with medication.

A Hazard and Operability Analysis is a well-known risk analysis method, it has a structured methodology which will look at process deviation, causes and consequences and when possible provide recommendations to mitigate the identified risks. (Fahim, Elkilani and Alsahhaf, 2010)

Recommendations were made after this study, but they related to education rather than design change. There was also an addition of a critical warning, but sometimes this was not added. We need to think about the capability and demand for any user group not just the elderly:

Capability: This looks at our ability to perform tasks, it can be cognitive, physical or visual perception.
Demand: Any task will require demands in order to be performed.

When the capability outstrips the demands there will be no problems. Where your capabilities are outweighed by the demands that's when problems arise. However, it is equally as bad to be in the middle as you might not even be aware that you are struggling.

Discussion with audience:

A key part is that we understand using a system thinking approach the reasons why the user behaves in a certain way. We are not saying behaviour change and education could be the outcome, beliefs are another personal factor and one which we cannot change easily. Another challenge with the systems approach is that you need to identify clear boundaries about what is in the system and what is out.

This concluded the morning sessions.

Lunch

Afternoon sessions:

Summary:

The afternoon sessions were Syndicate Workshops. There were three workshops which examined different aspects of labelling challenges.

These aspects included:

- Implementing a Systems Based Approach to delivering education around labelling in clinical practice
- Systems approach to Labelling and Packaging
- A systems approach to the designing of labelling and packaging of medicines

Session 5 – Breakout Syndicate Groups

Breakout Syndicate Topic 1: "Implementing a systems-based approach to delivering education around labelling in clinical practice"- By Sarah Pontefract and Walter-Rodney Nagumo

Summary of Discussion:

The session started with a presentation from Dr Sarah Pontefract to lead the tone and direction of discussion. The presentation engaged participants in a clinical pharmacy systems-based approach exploring important aspects of labelling in:

- Procurement
- Storage
- Supply
- Preparation
- Administration
- Management of risks

After deliberations, participants highlighted the following issues:

- The concern that manufacturers may all too often ignore issues requiring labels to be amended if they are not mandatory and there is insufficient traditional clinical trial evidence to demand change. Additionally, there is concern that there is an

imbalance and conflicting pressures between pharmacovigilance and commercial pressures on a company creating a vigilance gap between what they would like to do and what the system drives them to do.
- Education and awareness on labelling was considered important but its implementation yielded minimal effects compared to simulations.
- There is no single stakeholder involved in all systems and processes, and therefore no universal approach to education on labelling, but rather each component can be addressed based on its uniqueness.
- Simulations and experiential learning have been shown to have superior impact in educating clinicians compared to lectures and seminars and could be adopted for labelling.
- Future actions have therefore been recommended towards teaching about errors through integrated simulations, doing grand rounds, using technology and publicising patient testimonies.

Please refer to Appendix 5 for the full set of notes from the discussion within this syndicate group and Appendix 6 for the recommendations from the discussion.

Breakout Syndicate Topic 2: "Systems approach to labelling and packaging"- By Alison Black, Anthony Cox, Rosemary Lim and Helen Vosper

Summary of Discussion

The discussion began by discussing what information is necessary on the packaging. It was pointed out that it wasn't just the information content that was important, but also the way information is laid out in a way that is congruent with the way in which healthcare professionals are likely to think when approaching a medicine related task.

It was felt that the information is important in helping the user build a picture of how the medicine will be used, and it was also recognised that different users may need different pictures. It was also felt that a shared mental model regarding the use of a medication was very important, and that something like the SEIPS 2.0 framework offers a reasonable option. Other further points raised during the discussion include:

- Lack of standardisation, there was considerable discussion around this example included:
    - Strengths may be given as percentages or as weights per volume etc. it can be presented as a dilution or as in the case of electrolytes, a molar convention may be observed.
    - Sometimes information may be given in more than one form, and if this happens there doesn't appear to be any consistency as to the order in which it is presented.
- Pack sizes are not always obvious on the packaging.

- Critical information may be separated on the pack
- Brand name is usually the biggest/most prominent wording on the packet
- Much information which is present on the label reflects the regulatory requirements for the manufacturer
    - So, while the importance of expiry date was appreciated, the date of manufacture did not seem that important for the healthcare professional.
        - However, it was pointed out that this information might be important when it came to batch traceability if anything goes wrong.
    - This led the discussion to talk about the idea that different users will need different information, and that it seems impossible to design packaging that can be all things to all people.
- Supply problems mean that medicines can be sourced from anywhere, so consistency becomes even more important.
- Concerns around the unintended consequences of off-label use.
- Problems with insulin is an excellent example.

Please refer to Appendix 6 for the summary of recommendations from this syndicate group.

Breakout Syndicate Topic 3: "Using a systems-based approach to the design of medicines packaging and labelling to improve patient and healthcare provider safety"- By Alison Black, Anthony Cox, Rosemary Lim and Helen Vosper

Summary of Discussion:

Due to the group being large it started with a round of brief introductions. It was important to then ensure everyone was all clear about who "users" referred to within the context of medicines packaging and labelling. Alison then gave a short 10-minute talk, providing an introduction into typographic issues with medicines labelling and dispensing as well as some examples of typefaces that could help and hinder presentation of information. The presentation shed some light on the practical issues that were not considered previously and encouraged further discussions and thoughts around a wider range of labelling issues. It was clear delegates considered all stakeholders in the "supply chain" to be users, patients, healthcare providers and manufactures. The group was then split into 3 groups which was led by Anthony, Helen and Rosemary to discuss key issues facing the user group and potential "solutions"/recommendations, the 3 groups topics were as follows:

- Patients in their own homes
- Healthcare providers
- Manufactures

How medicines are used in patients' homes

- Patients store medicines in different locations/conditions
    - Back of fridge, medicines cabinet, food cupboard etc.…

- Patents often “decant”/repack medicines into other containers/compliance aids to help manage their medicines.
    - Potentially meaningful and important information on medicines packaging is “lost”.
- Different storage conditions could affect the integrity of the packaging.
    - E.g. Humidity can affect the paper box.
- Patients often workaround the packaging/labelling to suit their personal needs.

Key point-
There is variability in how patients store/ use their medicines (unsurprising given different types of patients and medicines/contexts) and the workarounds employed to make the task of taking medicines easier.

Key Question-
Do we know enough about the user environment to inform the design of medicines packaging and labelling? Is there a need to better understand the ‘work environment’ in patients own homes?

Potential for Future Work-
Ethnographic exploration of how patients use medicines within their own homes. Potential to focus on storage and administration.

Purpose of medicines packaging
- Is it designed to be a physical barrier to protect the medicine?
- Is it to provide information and if so, for whom?
- The purpose of the packaging and information is probably multi-fold and we should then then define the critical information required on the packaging.

Information leaflet and dispensing label
- What is the main purpose?
- Is it for the manufactures to meet a legal requirement or for patients?
- Is the information on leaflet accessible to a wide range of patients?
- Does the design of both consider different user needs?
    - Colour blindness, braille users?
- The dispensing label attached on medicines packaging- information on packaging may be occluded due to the way dispensing labels have been affixed/ the design of boxes (lack of space) and the form of medicines e.g. inhalers, eye drops, creams etc.

Key point-
Unclear who the key “audience(s)’ is /are for medicines packaging and labelling it is probably all user groups.

Key Question-
Who are the key groups of people who "need" the information on medicines packaging and labelling?

- What are their specific needs?
- How/can their needs be met within any relevant constraints relating to medicines packaging and labelling?

Potential future work-
Review/exploration of regulations/guidelines relating to medicines packaging and information to guide development of critical information required on medicines packaging and labelling.

Appearance of drugs-

- Different shape and colour month on month, depending on the manufactures.
    - This is a very complex issue that involves consideration of procurement (supply and demand), manufacturer needs to differentiate products.
        - Perhaps not within the scope of the discussions on the day.

<u>What can the industry do and what are the issues?</u>

- Constraints of regulation: risk aversion to changes that may be innovative with too few incentives to be imaginative.

- The speed to market can force design decisions that may not be optimal, but they happen because these decisions have been made before and appear to work. Again, why change what has 'worked' before?

- There was discussion about differentiation using colour. There was no definitive view in this group although feeling was value of colour was product and therapeutic area dependent.

- Concern that current system approach to authorisation of medicines view new products in isolation, outside of the clinical context they are used in.

- The questions that should go into product development is who are you designing it for, the prescriber or the end user? Different needs for different age groups. Should focus be on human factors, but whose?

- The group recognised that changes in lines expensive, that product development is based on what was first approval which will determine how the final product will be packaged.

- Insulin names and designs were brought up as a specific area of concern.

The recommendations from the discussions of this Syndicate Group are included in Appendix 6.

Feedback to meeting delegates from each of the Syndicate Groups

At the conclusion of the syndicate sessions, the three syndicate groups came back for some final comments and discussion. Colin Knight then invited comments on the discussions and all 3 syndicate groups felt there had been some fruitful discussions and good recommendations to take this work forward. He then invited delegates who were interested in being involved in follow-up work to give their details to him at the conclusion of the meeting. Colin would then coordinate next steps with those volunteers in due course. Colin then handed over to Brian Edwards for the Closing Remarks.

Session 6: Closing Remarks- By Brian Edwards

Brian Edwards: A thank you to Colin and the facilitators for the work which they have done. Brian had a discussion with the Chief Executive of the Institute who is excited by the topic and the Institute will continue supporting the group in its quest for more effective use of pharmaceutical products. The group will be feeding back the discussions that were had today to the ABPI, and a set of minutes will be created and shared with the MHRA, ISMN, FDA and ISMP to keep them in the loop. In addition, a Group newsletter will also be distributed soon.

There is an invisible glass wall between pharmaceutical and healthcare sectors; there are gaps between procurement, supply and administration stages of the system, and there are dark areas which we do not know what happens.

Brian mentioned that the work done today is a good start, and we should propose a model for risk minimisation actions for the pharmaceutical sector. We would also suggest a team to design risk minimisation actions for medication errors, which have been particularly identified by regulators as an issue for which no satisfactory answers have been provided.

Other follow-up from today's meeting by the Pharmaceutical Sector Group will include ongoing discussions on today's topics with the University of Hertfordshire, where they have a pharmacovigilance course as part of EU2P (https://www.eu2p.org/). In addition, they are starting a regulatory science course and are looking for topics. We need to have a think about a different approach to these courses and alter the dynamics of education and training with undergraduates and early postgraduates.

There will be a write up of this meeting available and Brian re-iterated the invitation for volunteers to help take this forward. If anyone is interested, please either give Brian or Colin your details today or contact either of them at a later stage.

The Pharmaceutical Sector Group are also interested in collecting examples of problematic medication labelling so please feel free to send those through to members of the Pharmaceutical Sector Group.

Brian thanks all the speakers and contributors to the meeting and thanked the delegates for attending. The meeting was then formally closed by Brian.

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APPENDICES

Appendix 1-Meeting Programme

08:30 Registration and refreshments
09:15 Welcome and setting the scene, Brian Edwards and Colin Knight
09:40 Keynote: Labelling Challenges from a Clinical Perspective,
Professor Jamie Coleman, Director of Associate Studies, and Professor of Clinical
10:10 Pharmacology at the University of Birmingham
10:35 Patient's perspective, Lisa Richards-Everton, Patient Safety Campaigner
11:00 Tea/coffee break
Taster workshops: A human factors approach to tackling labelling issues: Helen
12:15 Vosper and Rosemary Lim
13:15 Lunch
Break out syndicates:
Topic 1: Implementing a systems-based approach to delivering education around labelling in clinical practice
Facilitated by: Rodney Nagumo and Sarah Pontefract
Topics 2 & 3 combined:
Using a systems-based approach to achieve an industry-wide consensus for consistency on type font size and label colours for both generic and proprietary medicines
&
How would a systems-based approach to the layout of packaging information on medicines help to mitigate erroneous use of medicines by the end user?
Facilitated by: Alison Black, Rosemary Lim, Anthony Cox and Helen Vosper
Tea/coffee break
14:45 Feedback from each group with discussion
15:00 Wrap up and next steps, Brian Edwards and Colin Knight
15:45 Close

Appendix 2- International Medication Safety Network-Best Practice Guidelines (agreed at the June 2018 IMSN / FDA Summit and discussed further at13th Annual IMSN Meeting October 29 - 30, 2018, Cascais, Portugal https://www.intmedsafe.net/).

• Include both the per-mL and the per container quantity, not the per mL quantity alone, when presenting the concentration for injectable; with prominence given to total content per container.

• Use metric units for products and eliminate ratio expressions.

• Eliminate potentially error-prone abbreviations and dose designations on labels, such as U for units, IU for international units, and trailing zeros (e.g., 1.0) to express strength.

• Prominently display cautionary statements on the carton and immediate container labels of NMBs, KCL concentrate injection, methotrexate, and other selected error-prone medications.

• Use contrasting label backgrounds for printing on glass ampules and recommended font size and label orientation to improve readability.

• Physically link or integrate "special" diluents for "specific drugs" with their powder component.

• Increase the adoption of ready to use/ready to administer syringes, premixed IV solutions, unit-dose packaging and other more efficient, safer packaging, while considering the overall cost of implementation.

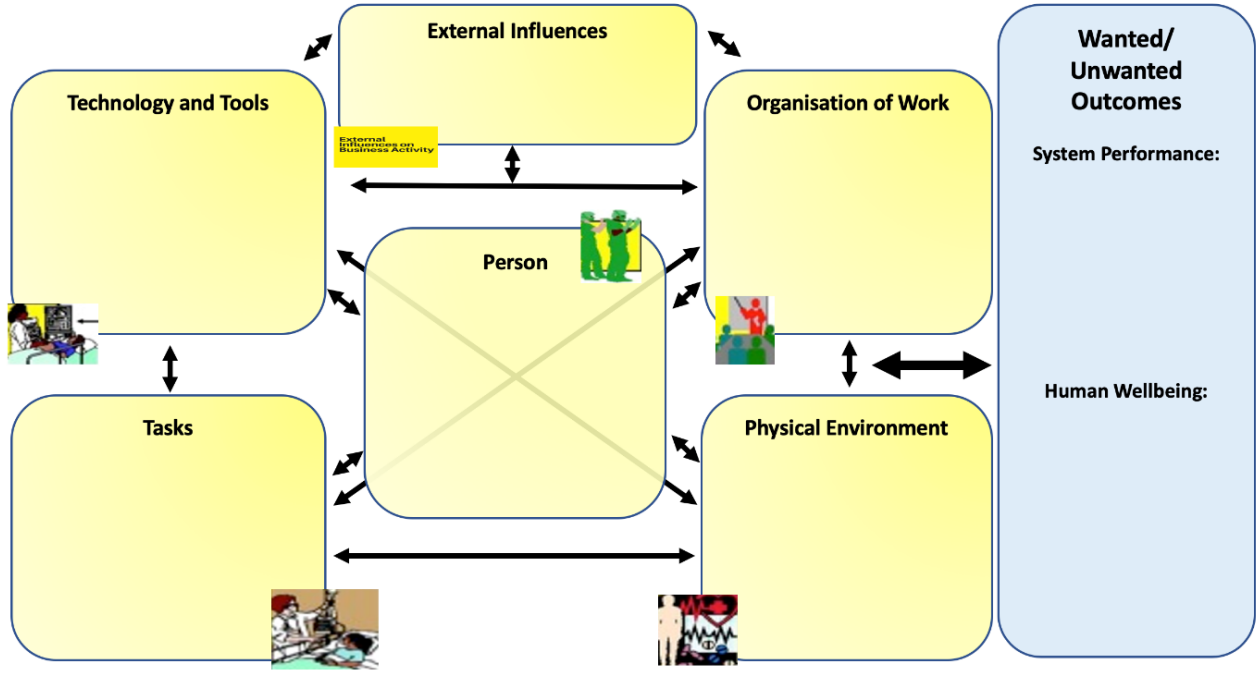
• Develop product-specific world safety standards; for example, standard packaging for non-oncologic methotrexate to prevent accidental daily use and overdose.

• Include barcodes on primary packages so they can be scanned at the bedside or other locations where medications are dispensed and administered by healthcare practitioners.

• Mention prominently international non-proprietary names (INN) on labels.

Appendix 3- System Engineers Initiative for Patient Safety (SEIPS) diagrams used in Training Workshop.

The diagram below shows the template which delegates were given to work through during the workshop.



The diagram below provides some guidance on filling out the SEIPS template as shown above.

Person Factors e.g.
Physical, psychological capabilities, limitations and impacts (frustration, stress, fatigue, burnout, musculoskeletal, satisfaction, enjoyment, experiences, job control); personality or social issues; cognitive ; competence, skills, knowledge, attitudes; risk perception; training issues; personal needs and preferences; psychological safety; performance variability; personal goals; adaptation to work conditions.
Care team e.g. roles, support, communication, collaboration, supervision, management, leadership
Patient/client e.g. complexity of clinical condition, physical, social, psychological, relationship factors
Others e.g. families and carers, and other health and social services colleagues

Tools and Technology Factors e.g.
e.g. design interaction and usability issues; positioning; availability; access; mobility; operational/calibrated; device usability; various IT design issues; electronic records, barcoding.

Task Factors e.g.
level of task complexity; time taken; hazardous nature; capacity and demand match/mismatch; distractions; interruptions; variety of tasks; job content, challenge and utilization of skills; autonomy, job control and participation; job demands (e.g. workload, time pressure, cognitive load, need for attention)

Physical Environment Factors e.g.
Layout; Noise; Lighting; temperature; humidity and air quality; design of immediate workspace or physical environment layout; location; size; clutter; standardisation, aesthetics; crowding.

Organisation of Work Factors e.g.
Coordination, collaboration and communication; organizational culture and safety climate; work schedules and rota design; social relationships; teamwork; supervisory, management and leadership style; performance evaluation, rewards and incentives; organisational strategy, work priorities/targets; conflicting goals; structure and hierarchies; staffing levels; rewards and incentives; risk assessment; **education, training and development environments e.g.** supervision, competence, protected time, professional development, physical and social learning environment

External Influences e.g.
Societal, government, cultural, accreditation and regulatory influences e.g. funding, national policies and targets, professional bodies, regulatory demands, legislation and legal influences, other risks and influences

Outcomes – System Performance e.g.
Safety; productivity; resilience; reliability; efficiency; effectiveness; care quality; budgetary control

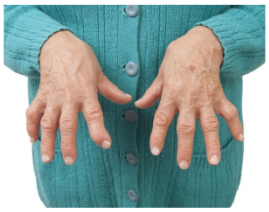
Outcomes – Human Wellbeing e.g.
Health and safety; patient satisfaction and experience; enjoyment; staff turnover; staff welfare; job satisfaction

Appendix 4-Taster Workshop MaterialS Provided

The following are the slides of information regarding the case study performed during the taster workshop.

Persona: Meet Mrs M

- 78 years old
- Lives alone
- Eyesight poor
- ?mild cognitive impairment
- Rheumatoid arthritis
- High risk for CVD
- Drugs: Methrotrextate as a DMARD (and folic acid)
- Statins, low-dose aspirin, calcium 'antagonists'



Mrs M's condition management system

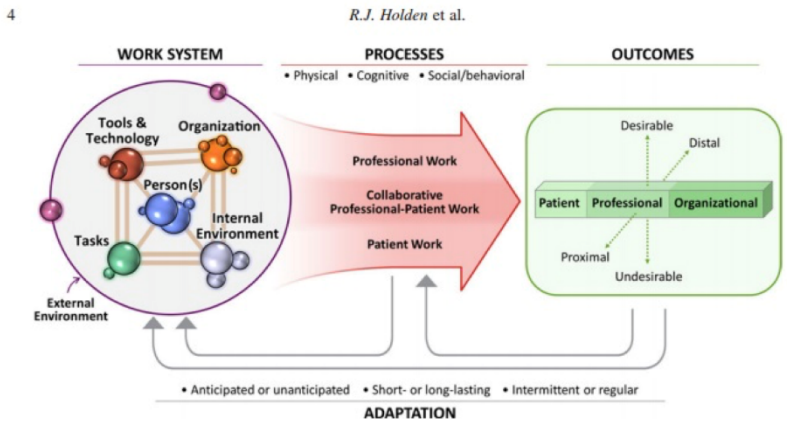


Figure 1. SEIPS 2.0 model.

Mrs M's condition management system

- Entities
- Factors pertaining to entities
- For example:
- 'patient' – *entity*
- 'patient's **condition**' (RA) – *factor* pertaining to entity
- Need to start by listing entities
- How/where does the information come from?

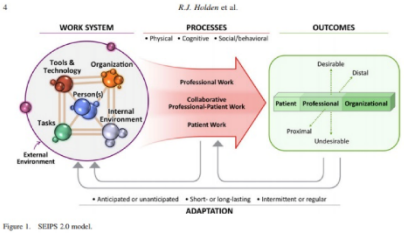


Figure 1. SEIPS 2.0 model.

Mrs M: a development

- Daughter notices her mother seems unusually tired
- Pale
- Complains of a sore mouth (visible ulcers)
- Frequent nosebleeds
- Bleeding gums
- Bruising that can't be explained
- 'Palpitations'

Methotrexate: mechanism of action

- Dihydrofolic acid reductase inhibitor – blocks folic acid (and therefore DNA) synthesis
- At high doses anti-proliferative
- Low doses less clear, but has an anti-proliferative effect on lymphocytes, also cytokine suppression
- Toxicity associated with mucosal (sometimes skin) erosion, pancytopenia
- Can be reversed if caught early but can be fatal
- Incidence unclear, but deaths are still happening

Appendix 5-Detailed discussion notes from syndicate topic "implementing a systems-based approach to delivering education around labelling in clinical practice"

Procurement

Pharmacists are a main stakeholder driving NHS procurement by dictating to the NHS about purchasing on a wide a range of medicines and what needs to be done. There is MHRA good practice guidance on labelling and packaging of medicines, as well as some requirements outlined in EU legislation. However, there is little national instruction as to what relabelling should look like, if it is required within the healthcare system, to ensure a systematic approach.

Although clinicians have reported labelling concerns, there is a perception in healthcare that the current pharmacovigilance system is inadequate to respond. Branding appears to take prominence over scientific aspects of labelling and the introduction of generics makes the situation even more precarious e.g. colours becoming similar etc.

Lack of evidence for NHS to act upon to preferentially choose better designed labelling is an issue. Unfortunately, anecdotal evidence is normally not enough to effect detailed change. Proactive surveillance to solicit good quality reports rather than reacting to poorly documented spontaneous reports is important. Obviously for new products the situation is different as it generally accepted through the system that these new products may have labelling issues of which HCPs are unaware.

Storage

The storage of medicines is important, not only to ensure integrity of the product (temperature and humidity), but also to reduce the risk of selection errors. Patients may have different issues to deal with e.g. having two drugs with similar names or packaging. Patients might store them in separate containers to avoid selection bias (such as arranging tablets at the beginning of the week).

When retrieving stored medicines, clinicians may fail to see important information because key information is competing for space with branding design on the label. Clinicians may well have a mental image of what they are looking for but may well fail to see it if they are distracted.

Evidence base for designing packaging and labelling optimally for storage is not normally part of product development and so is lacking.

Education on high risk mislabelling is important. Mixing ceftazidime and cefepime might be a low risk error. In contrast, mixing a high-risk medicine could be fatal. However, a consensus across the system about what are high risk medications from a clinical perspective is lacking. Analysis of these lower risk error works is a gold mine for future research and publications.

Apart from patient leaflets, medicines packaging and labelling do not go through any form of usability testing unless requested during the regulatory approval process. Although the system collects error reports, there is no agreed systematic process how they should be investigated, and the results acted upon.

Similarity/dissimilarity?

Concern was expressed about whether current regulatory practice adequately evaluates naming similarity in products comprehensively enough and what checks are in place that all likely combinations of naming confusion that might happen in real life can be identified.

It's important for industry to ask clinicians which name similarities are clinically important and arrange a campaign on this topic to obtain more data, such as through patient PV. The impact of how names are chosen as part of patent approvals should be examined further.

Different countries have different methods for labelling products which explained the need for IMSN to give consensus guidance. In some countries, the delegates were informed that the trigrams system was used which relies on similarity of the alphabets and ratios and total number of words to determine label names. Thus, the need to harmonise regulatory approaches was self-evident.

We should know what works first before requesting for label change which means having that across the whole system should agree. There may be other ways of differentiating medicines, making clinicians take responsibility by designing processes so that they do the right thing for the patient. Labelling has a place in this e.g. if there is a symbol such as a black triangle or something that alerts the system to recognise that errors with these medicines are important (high risk medicines.

Supply

Patients have inadvertently overdosed on lomustine, because an alternative brand was supplied with a greater quantity of capsules than the single dose required. Belustine and CCNU have been confused in the past because of labelling on same strengths but different quantities. CCNU is an alternative name for Lomustine, which is a chemotherapy drug used to treat several types of different cancers.

In cases such as this, a period of change control is required to ensure the two products do not exist in the same space. During this period, staff are trained on the change while the old product is removed and the new one introduced.

Appendix 6-Recommendations from the Breakout Syndicates

Topic 1: Implementing a systems-based approach to delivering education around labelling in clinical practice- By Sarah Pontefract and Walter-Rodney Nagumo

Priming Clinicians: Every systems design is never fool proof; not making an error is an unrealistic pipedream. You might be surprised when things go wrong, but you should also be surprised when things go right without hitches. We need to prime the interlinking systems. Training and education requirement will be different at different parts of the system.

Technology: Another idea would be to facilitate discussions about how to design or implement new technology in a real world. We should be much more aware of the system design and encourage people to reflect more and more on their own situational awareness in terms of labelling. For example, by using a QR code, which gives you direct access to the labelling information, patient details can be displayed on a device.

System redesign: It is possible to produce labelling that educates especially at all the different supply chain levels. The capacity for sophisticated labelling has always been there for a long time but cost implication deters stakeholders. For example, a label could be designed on a vial so that, it wraps around and as you unpeel it, you get different types of information at every stage e.g. dosing, ADRs etc.

System component specific training: Even though we need to identify where stakeholders fit in the system and match them with best training topics based on competencies that they would need at each step of the system; it is almost not practical. The whole thing must be designed together. We need specific examples to support this idea e.g. how can frontline staff such as nurses can better understand and be reassured about what happens in procurement. Cross-disciplinary training may be required because no one follows the system throughout from end to end.

Stakeholder communication and collaboration: We need education and communication with the manufacturers and regulators such as the Medicines and Healthcare Products Regulatory Agency (MHRA) and the NHS about labelling issues. More importantly, communicating the issues of labelling at postgraduate studies level could enhance integrated simulations in their learning.

Moving trusts: Moving trusts helps especially in nursing. Other clinicians may learn from experiences of previous post. (Moving out of working environment might also have negative implications for error.) Using the products in a different working environment may require some education or awareness on how it should be used. It is worth noting that different brands may be used in different Trusts though, so there may also be problems with this (i.e. by assuming the same medicines are used).

Learn to raise issues about labelling in a non-blaming way. Healthcare professionals should be taught how to identify labelling issues in the ward rounds and not to treat them as culpable offences but points for education and ways to improve systems.

Topic 2: Systems approach to labelling and packaging- By Alison Black, Anthony Cox, Rosemary Lim and Helen Vosper

- Working with all users to try and identify the critical information for each user group is very important.
    - Following on from the Buckle et al. (2010) paper which describes systems mapping workshops, these could help in exploring further this concept of matching information with user.
- Anaesthetists were also boundary users; they use a lot of injectable medicines in a very short space of time and often in high stress conditions.
    - They also have the advantage of being the end user for many of the medications, at least, within the operating theatre where the patient has no need to see the medication.
        - This is potential project the group could take further.
    - This also reflects contemporary needs, as reflected by many of the attendees at this meeting being anaesthetists.
- Need to be careful that attempts to standardise don't end up with packaging that doesn't work for anybody.
- Need international standards for high-risk medicines particularly.
- Need much tighter regulatory implementation - mandatory information (once we know what it is). For example:
    - Pharmacists allowed to use their judgement in deciding about what information should be added to regulated packaging. However, on what evidence should this" judgement" be based?
- Critical need to work with inclusive designers who can ensure that people aren't prevented from safely accessing their medication because of impaired/reduced capabilities.
    - The meeting noted that pharma companies have now recognised this and employ such professionals. This is welcome although we do not know how prevalent this is.
- The recognition that impairments can be temporary and work-induced, an example being:
    - Someone working in sterile conditions who accidently contaminates a syringe may not be able to put this down immediately and so must continue working meaning they are temporarily become one-handed.

The need to start with a problem statement:
"Truly know your users, their different operating environments and capabilities (including any temporary and permanent impairments). We can then better design labelling and any other supplementary educational and communication materials to meet their needs."

Topic 3: Using a systems-based approach to the design of medicines packaging and labelling to improve patient and healthcare provider safety- By Alison Black, Anthony Cox, Rosemary Lim and Helen Vosper

- Ethnographic exploration of how patients use medicines within their own homes. Potential to focus on storage and administration.

- Review/exploration of regulations/guidelines relating to medicines packaging and information to guide development of critical information required on medicines packaging and labelling.

Appendix 7-ISMN Comparison Table

Comparison data:
ISMN Best Practice Guidelines vs. Comparative Issues from Meeting

ISMN Best Practice Recommendations	Similar / Same challenges addressed at Meeting
Include both the per- ml and the per container quantity, not the per mL quantity alone, when presenting the concentration for injectable; with prominence given to total content per container.	"Strengths may be given as percentages or as weights per volume etc. it can be presented as a dilatation or as in the case of electrolytes, a molar convention may be observed"
Use metric units for products and eliminate ratio expressions.	"Strengths may be given as percentages or as weights per volume etc. it can be presented as a dilatation or as in the case of electrolytes, a molar convention may be observed"
Eliminate potentially error-prone abbreviations and dose designations on labels, such as U for units, IU for international units, and trailing zeros (e.g., 1.0) to express strength.	"Sometimes information may be given in more than one form, and if this happens there doesn't appear to be any consistency as to the order in which it is presented. " "Look alike and sound alike drug names, are an issue as it means that mistakes can easily occur."
Prominently display cautionary statements on the carton and immediate container labels of NMBs, KCL concentrate injection, methotrexate, and other selected error-prone medications.	"The dispensing label attached on medicines packaging- information on packaging may be occluded due to the way dispensing labels have been affixed/ the design of boxes (lack of space) and the form of medicines e.g. inhalers, eye drops, creams etc."

	"Pharmacovigilance elements of manufactures is often not as strong as the marketing element creating a vigilance gap." "Critically related information may be separated on the pack" "Simple messages, so that people know what is inside." "Making information part of the packaging and not the use of stickers, as it can cover up important information. "
Physically link or integrate "special" diluents for "specific drugs" with their powder component.	"The capacity for sophisticated labelling has always been there for a long time but cost implication deters stakeholders." "A label can be designed on a vial such that, it wraps around and as you unpeel it, you get different types of information at every stage e.g. dosing, side effects, ADR etc."
Develop product-specific world safety standards; for example, standard packaging for non-oncologic methotrexate to prevent accidental daily use and overdose.	"Need international standards for high-risk medicines particularly." "Need much tighter regulation-mandatory information (once we know what it is)" "Review/exploration of regulations/guidelines relating to medicines packaging and information to guide development of critical information required on medicines packaging and labelling."

	"Different countries have different methods. America has the trigrams system where similarity of the alphabets and ratios and total number of words are used to determine label names."
Include barcodes on primary packages so they can be scanned at the bedside or other locations where medications are dispensed and administered by healthcare practitioners	"Using a QR code, which gives you direct access to the labelling information, and patient details you need on a device."
Mention prominently international non- proprietary names (INN) on labels	"Using a generic name will help this, as more easily recognised"