Medicine administration to patients with feeding tubes & swallowing problems

How to improve knowledge and skills of healthcare providers & patients?

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Yolande Hanssens, Doha - Qatar

Who are We??
Objectives

- To understand the legal & pharmacological consequences of cutting & crushing “extended release” preparations
- To get familiar with codes used by drug companies for medication with “extended & modified release” properties
- To identify alternatives for patients with swallowing problems & feeding tubes
- To state possible drug-food & drug-tube interactions
- To enable you to assess training needs in your working environment
How?

- Introduction
- Legal-ethical issues
- Responsibilities – therapeutic issues for healthcare providers
- Case studies focusing on therapeutic issues
  → active involvement of participants
  → best practice info by WS moderators
- Evaluate & plan training needs in your working environment
- Q & A
- Conclusion

Why now?

“Pill crushing probably was not such a problem 10 - 20 years ago, but now drugs have become very sophisticated”
2.5 mg “normal” tablet versus LA 10 mg

Controlled release is achieved by constructing a tablet of two basic components:

- A core of hydroxypropyl methylcellulose (HPMC) matrix that contains the active drugs
- One or two additional barrier layers that control the surface area diffusion of drug or drugs out of the core

Good coating involves sophisticated techniques, research, testing etc.

BUT

!! Can NOT be crushed without thinking of the consequences
Ideal drug delivery system should be:

- Inert & easy to fabricate
- Biocompatible
- Mechanically strong
- Comfortable for the patient
- Capable of achieving high drug loading
- Safe from accidental release
- Simple to administer

Can you tell which is “coated” or not?

! Not really ...
Can be tablet, capsule, granules into capsules, ....
Also

“Chewing medication prior to swallowing must also be considered as this can have the same effect as crushing tablets or opening capsules”

Let’s look at some codes used for LA and SR

- Chrono
- CR
- CRT
- LA
- MR
- OCAS
- Oros
- Perlonettes
- PL
- Retard

- SA
- SR
- TD
- TR
- UNO
- XR
- XL
- ZOK
- ... None
Other Codes

- ®
- EC
- ™

Overall aim of “SR”
Blood level remains constant between desired max. & min. for an extended period of time
- 24 hrs
- 1 month
- 5 years
Let's look at Adalat® preparations

- 10 mg capsule
- 20 mg Retard tablet
- 30 mg LA tablet

What are those consequences?
Comparative Drug Levels for Adalat® LA 30 mg tablet

Levels x 6
Duration: 12
Introduction (cnt’d.)

Crushing pills ‘can prove fatal’


‘I will always blame myself’

PATIENT DIES AFTER CHEWING MEDICATION

Crushing Pills Can Lead To Serious Complications And Even Death (Oct 2006)


Bronzetti et al. Solution to a crushing dosage problem? Pediatrics 2004;113;1468

Legal issues

- Crushing ≈ UNLICENSED USE
- No liability for any ensuing harm
- Medicines Act 1968 (UK)
- Doctor - pharmacist - nurse
- Criminal - civil - administrative law
Legal issues

- **Adequate information**
  - Prescription – route of administration
- **Prior consent!** (patient ? public pharmacy ?)
- ~ up-to-date protocols and national guidance
- **Potential benefits >> risk of harm**
  - liquid formulation?
- **Not simply accept - record actions**
- **Remarks**
  - occupational exposure !
  - crushing - opening - chewing
  - injectable medication via tube

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Ethical issues

- **Human Rights Act 1998**
  "Care must be given with respect and be proportionate to the needs of the person"

- **‘Five patient rights’ (J CAHO)**
  - right drug
  - right dose
  - right route
  - right time and frequency
  - right patient
  + right formulation ?

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How?

- Introduction
- Legal-ethical issues
- Responsibilities - therapeutic issues for healthcare providers
- Case studies focusing on therapeutic issues → active involvement of participants → best practice info by WS moderators
- Evaluate & plan training needs in your working environment
- Q & A
- Conclusion

Into 4 groups

- What do you expect
  - Pharmacists
  - Doctors
  - Nurses – dietitians
  - Patients and their carers

To know?
Knowledge, skills & responsibilities

<table>
<thead>
<tr>
<th>PharmD.</th>
<th>M.D.</th>
<th>NURSE</th>
<th>PATIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUSH YES-NO ALTERNATIVES</td>
<td>INDICATION</td>
<td>ADMINISTRATION</td>
<td>DOSAGE REGIMEN</td>
</tr>
<tr>
<td>DOSAGE REGIMEN</td>
<td>CRUSH YES-NO ALTERNATIVES</td>
<td>DOSAGE REGIMEN</td>
<td>ADMINISTRATION</td>
</tr>
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<td>ADMINISTRATION</td>
<td>DOSAGE REGIMEN</td>
<td>CRUSH YES-NO ALTERNATIVES</td>
<td></td>
</tr>
</tbody>
</table>

Therapeutic issues

- Active substance
- Dosage form
- Feeding tube
- Feeding solution
- Alternatives
- Administration method
- Therapeutic plan
Case 1

- Mr. MI, 76 yrs
- Medical history: HTN, DM
- Current problem: “painful legs”
- R/ in clinic pentoxyfylline (T(o)rental®)
  400mg tid
- at home - nausea & vomiting, no appetite
  and admitted 5 days later

→ Issues & management?

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Case - Issues & Management

- Tablets too BIG

  → severe nausea & vomiting
  → no appetite

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Immediate-Release Capsules
Used Only for Controlled Clinical Trials

(Number of Patients at Risk)  Pentoxifylline  Placebo

Discontinued for Side Effect (%)  9.6  7.2

DIGESTIVE SYSTEM
Abdominal Discomfort  4.0  1.4
Belching/Flatus/Bloating  9.0  3.6
Diarrhea  3.4  CR  2.9
Dyspepsia  9.6  2.8  2.9
Nausea  28.8  2.2  8.7
Vomiting  4.5  1.2  0.7

Discontinued for Side Effect (%)  9.6                  7.2

Case 2

- Mr. K, 20 yrs
- diagnosis: polytrauma, epilepsy
- intervention: orthopedic surgery
- R/ Depakine Chrono (valproate) as 500 mg 2x/day
- Continuous enteral feeding

→ Issues & management?
**Sustained Release (SR) products (cnt’d)**

Crushing of slow-release preparations

→ initial dose dumping (potential toxic effect)
→ followed by a possible sub-therapeutic period

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**Enteric Coated (EC) products**

Designed not to be released in stomach
- to protect drug in stomach
  Crushing will cause loss of efficacy
  e.g. omeprazole, pancreatic enzymes
- to protect stomach from drug toxicity
  Crushing will cause side-effects
  e.g. aspirin
Micro-encapsulated products

Tablets or capsules containing pellets or beads
- to protect drug in stomach
e.g. LOSEC mups®, CREON® caps
- to control release of the drug
e.g. XANTHIUM® (theophyllin)

If pellets do not remain intact:
loss of intended effect

Soluble, dispersible or effervescent tablet

Tablets to be dissolved or dispersed in water
- effervescent tablet
  sodium content
  must be fully dispersed to avoid gas production in enteral tube

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Sublingual (SL) tablet

- absorption through oral mucosa
- to bypass first-pass metabolism

administration via enteral feeding:
↓ drug absorption

Liquid formulations

Solutions
Elixirs
Suspensions
Syrups
Liquid formulations (cnt’d)

Osmolality

high osmolality:
- diarrhoea
- cramps
- abdominal distention
- vomiting

- GI secretions: 100 - 400 mOsm
  but many commercial oral liquids > 1000 mOsm
- Role of volume

Liquid Formulations (cnt’d)

Excipients

sweeteners e.g. sorbitol
- diarrhoea, bloating, stomach cramps & delayed gastric emptying

xanthan gum
- increases viscosity
Liquid formulations (cnt’d)

Suspension:
“bezoar” – e.g. sucralfate, ciprofloxacin
“caking” – e.g. Augmentin®

Syrup:
- syrup with acidic pH: may clump with enteral feeds
- sugar content (diabetic patient)
  ⇒ sugar-free (sorbitol !)

Case 2

- Mr. K, 20 yrs
- diagnosis: polytrauma, epilepsy
- intervention: orthopedic surgery
- R/ Depakine Chrono (valproate) as 500 mg 2x/day
- Continuous enteral feeding

→ Issues & management?
Case - management

Depakine Chrono: controlled release

Alternative formulation

- Liquid dosage form
  - Syrup - Viscosity
  - Ampoule - Enteral?
  - Solution 300 mg/ ml
    - Adjust frequency
    - 2 x 500 mg ⇒ 3 x 333 mg

Case 3

- Mr. M, 60 yrs
- current problems: coronary heart disease, 
  Pseudomonas aeruginosa infection
- intervention: bypass operation
- R/ Ciprofloxacin tablet 500 mg 2x/day
- Intermittent enteral feeding

Issues & Management?
Enteral feeding solution

Nutrients in the enteral feeding can affect drug absorption
e.g. ciprofloxacin binds to divalent ions in enteral feed

Incompatibility/interaction between feeding and medication
e.g. warfarin and vit K in enteral feed

Formation of bezoar
e.g. sucralfate binds to protein

Enteral feeding solution (cnt’d)

Effect on nutrient absorption
e.g. calcium acetate can bind to phosphate in enteral feed

Drug to be given on empty stomach
e.g. levothyroxin, alendronate

Unknown interactions
e.g. penicillin V, theophyllin, phenytoin
Enteral feeding solution (cnt’d)

When interaction with enteral feeding solution

→ stop enteral feed 1 to 2 hours before and 2 hours after drug administration (minimize feeding interruptions to avoid compromising nutritional status of patient)

→ monitor response and/or plasma levels

Enteral feeding solution (cnt’d)

Some drugs need to be taken with food

- to be taken with fat food
e.g. Kaletra® (lopinavir + ritonavir) - oral solution

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Enteral feeding solution (cnt’d)

Adding drugs to enteral feeds?

- wastage of medication when enteral feed is discarded before administering total dose
- no information on possible interactions
- ↑ risk of tube blockage due to coagulation of feed proteins, or “clumping” of the feed
- possibility of microbial contamination

Case 3

- Mr. M, 60 yrs
- current problems: coronary heart disease, *Pseudomonas aeruginosa* infection
- intervention: bypass operation
- R/ Ciprofloxacin tablet 500 mg 2x/day
- Intermittent enteral feeding

→ Issues & Management?
Case - management

- Ciprofloxacin interacts with enteral feeding:
  binding with divalent ions in enteral feeding

  **Administer during break in enteral feeding**

- Liquid dosage form is available
  - Ciprofloxacin suspension 250 mg/5 ml
  **But** very viscous suspension, risk of tube blockage

  **Crush tablets**

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Case 4

- Mr. AK, 22 yrs
- RTA, severe head injury
- R/ Phenytoin – seizure prophylaxis
  Ciprofloxacin – *Pseudomonas aeruginosa* infection

  **BUT** enteral feeding for 20/24 hrs

  → **Issues & management ?**
Challenges for phenytoin

Mode of administration

**IV**
- dilution rate
- in line filter
- complications

**IM**
- slow & erratic absorption

"PO"
- capsules & suspension

Phenytoin plasma conc. (microM)

Narrow Therapeutic Window

Therapeutic range

Daily dose (mg)

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Challenges for phenytoin
some guidance ...

- Level within 24 hrs after loading dose
- Albumin < 30 g/L (N 35-50) → also free level
- Monitor: efficacy
  side effects
  need
drug levels (total vs free)
- Discuss adjustment & changes with prescriber

Case 4

- Mr. AK, 22 yrs
- RTA, severe head injury
- R/ Phenytoin – seizure prophylaxis
  Ciprofloxacin – *Pseudomonas aeruginosa* infection
  **BUT** enteral feeding for 20/24 hrs
  → Issues & management?
Case 4 - management in ICU

- Mr. AK, 22 yrs
- RTA, severe head injury
- R/ Phenytoin – seizure prophylaxis
- Ciprofloxacin – *Pseudomonas aeruginosa* infection

**BUT** enteral feeding for 20/24 hrs

→ phenytoin IV for 1/52, to carbamazepine ngt for long term treatment
→ ciprofloxacin as IV >> enteral

Case 5

- Boy, 3 yrs, 20 kg
- General paediatric ward
- History: epilepsy, GORD, chronic malnutrition
- Intervention: jejunostomy PVC tube placement Ch. 10

- R/ full-dose, high-caloric, continuous enteral feeding
  - omeprazole MUPS tablet 20 mg OD dissolved in 10 ml water
  - carbamazepine tablet 100 mg TID
  - phenytoin sodium caps. 60 mg TID
  - cefuroxime-axetil syrup (250 mg/5 ml) 300 mg BID
  (postoperative for bacterial sinusitis)

→ Issues & Management?
Enteral feeding tube

- Issues
  - position and type of tube
  - tube material
  - tube size
  - tube function – multilumen tubes

Position and type of tube

- Nasoenteric tube
  - nasogastric (NGT)
  - nasoduodenal (NDT)
  - nasojejunal (NJT)
  - short-term needs
Position and type of tube

- Percutaneous tubes

  - gastrostomy (PEG)
  - jejunostomy (PEJ)
  - gastrojejunostomy (PEGJ)

  → long-term needs

Position and type of tube

- Increased bioavailability with intrajejunal administration of drugs with extensive first-pass metabolism
  e.g. opioids, tricyclics, beta-blockers, nitrates

- Lower bioavailability with intragastric administration of enteric-coated drugs
  e.g. pancreatic enzymes

MONITOR
CONCENTRATION- EFFECT
ALTERNATIVES
Position and type of tube

- Enhanced side-effects
  - rapid delivery of drug into small bowel
  - crushing of enteric-coated drugs
    e.g. enteric-coated aspirin

- Reduced drug absorption with intrajejunal drug administration
  - pH effects
    e.g. ketoconazole, itraconazole
  - reduction of absorption surface and time

Tubing material

- polyvinylchloride (PVC)*
- silicone or latex
- polyurethane

*Adsorption of lipophilic drugs
  e.g. phenytoine, nitroglycerin, carbamazepine, diazepam
**Tube size**

- **Nasoenteric tube**
  - small-bore (6-12 Fr) vs. large-bore (12-16 Fr)
  - long (90-150 cm)
- **Percutaneous tube**
  - usually large-bore tubes
  - shorter

> **Risk of clotting** (crushing – viscosity)

**Tube function**

- Gastric aspiration – feeding
  > preventing drug absorption
- Multilumen tubes
  - gastric aspiration
  - jejunal feeding
  > wrong lumen ~ issues of tube position
Case 5

- Boy, 3 yrs, 20 kg
- General paediatric ward
- History: epilepsy, GORD, chronic malnutrition
- Intervention: jejunostomy PVC tube placement Ch. 10
- R/ full-dose, high-caloric, continuous enteral feeding
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    (postoperative for bacterial sinusitis)

→ Issues & Management?

Issues & Management

- Carbamazepine & phenytoin adsorption on PVC tubing?
  - adequate flushing before and after administration
  - therapeutic drug monitoring of both drugs
  - (hospital-wide use of PUR tubing?)

- Tube clotting?
  - switch to carbamazepine syrup 100 mg/5 ml, dilute 1/1
  - switch to phenytoin sodium susp. 100 mg/4 ml, dilute
    (TV of 5 ml; hyperosm.) (IV phenytoin + water: precipitation)
  - switch to omeprazole bicarbonate suspension ??
    arguable (Ch. 10 – sodium bicarbonate content)
  - dilute cefuroxime-axetil syrup to min. 15 ml
  - adequate flushing before and after administration
Issues - Management (cnt’d)

- Poor bioavailability of phenytoin after jejunal adm.?
  - therapeutic drug monitoring of phenytoin
  - during hospitalisation – IV switch (max. PO dose, diarrhoea)? (note: bioavailability of omeprazole - cefuroxime of less concern)

- > side-effects of carbamazepine after jejunal adm.?
  - spread dose interval (qid) (conflicting!) if dizziness
  - lower dose if problematic dizziness (TDM)
  - during hospitalization – IV switch (diarrhoea)?

Case 6

- Girl, 2 yrs, 10 kg
- Paediatric haemato-oncology ward
- History: Acute Lymphoblastic Leukemia (ALL)
- Med. Interv.: treatment of ALL, bowel decontamination neutropenia, cyclic gastric feeding
- R/ IV - IT cytostatics ~ Hickmann catheter
  - IV anti-infectives (aciclovir, ampho B)
  - colimycin capsule 500000 IU BID
  - mercaptopurine ½ tablet 50 mg OD (scored)

→ Issues & Management?
Administration

• Issues
  – drug preparation
    ➢ crushing - disintegrate - diluting
  – administration technique
  – administration device
  – tube flushing - blocking

Drug preparation

• Crushing method for solid oral formulations
  (pharmacy - ward - patient)
  – mortar and pestle
  – crushing device

  ➢ particle size >>!
  ➢ remaining particles (rinsing !; no fractioning !)
  ➢ (light) stability ? (extemporaneous administration)
  ➢ microbiology - hygiene
  ➢ cross-contamination
Drug preparation (cnt’d)

- Extra note: crushing method for solid oral formulations

  - toxicity for operator
    - hazardous drugs (class I)
      - (pharmacy) preparation (LAF)
      - dissolve in warm water
      - closed-system crushing syringes
    - antibiotics, antivirals, hormones (class II)
      - gloves, mouth mask

Drug preparation (cnt’d)

- Disintegration method for solid oral formulations
  (pharmacy - ward - patient)

  - effervescent, dispersible, compressed tablet
    - compressed tablet: particle size >> !
    - volume of water ?
    - (light) stability ? (extemporaneous administration)
    - remaining particles (rinsing !)
    - microbiology - hygiene
    - cross-contamination (clean !)
Drug preparation (cnt’d)

- Diluting method for (oral) liquids
  (pharmacy - ward - patient)

  - viscosity solution, elixir <suspension<syrup

- (volume of) water ? (osmolality)
  e.g. diazepam drips
- stability (light, pH) ? (extemporaneous administration)
- remaining particles (rinsing !)
- microbiology - hygiene
- cross-contamination (clean !)
Administration device

Alert
28 March 2007
Deadline 30 Sept 2007

Promoting safer measurement and administration of liquid medicines via oral and other enteral routes

Table 1: Clinical outcomes of NRLS wrong route incidents where oral liquid medicines were administered by the intravenous route, reported to the NRLS between 1 January 2005 and 31 May 2006

<table>
<thead>
<tr>
<th>Clinical outcome</th>
<th>No. reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>1</td>
</tr>
<tr>
<td>Severe harm (permanent harm)</td>
<td>2</td>
</tr>
<tr>
<td>Moderate harm (significant, but not permanent harm, requiring an increase in treatment)</td>
<td>2</td>
</tr>
<tr>
<td>Low harm (temporary harm, requiring extra observation or minor treatment)</td>
<td>8</td>
</tr>
<tr>
<td>No harm</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

- Use of oral/enteral syringes
- Adequate labelling
- No adaptors enabling connection of enteral syringes to fit luer ports
- Training and audit
Tube blocking

- Flushing technique - regimen
  - volume (> < fluid restriction)
  - pulsatile
  - water (> < acidic fluid)
  - frequency

- Drug administration
  - particle size ~ crushing method
  - feed-drug precipitation
  - drug-drug precipitation

- Feed precipitation (proteins)
- Viscosity of liquids
- Tube diameter - material
- Bacterial colonization

Tube blocking (cnt’d)

- Warm water
- Cola ?
- Pancreatic enzymes ?
- Mechanical devices ?
Case 6

- Girl, 2 yrs, 10 kg
- Paediatric haemato-oncology ward
- History: Acute Lymphoblastic Leukemia (ALL)
- Med. Interv.: treatment of ALL, bowel decontamination neutropenia, cyclic gastric feeding
- R/ IV - IT cytostatics ~ Hickmann catheter
  IV anti-infectives (aciclovir, ampho B)
  colimycin capsule 500000 IU BID
  mercaptopurine ½ tablet 50 mg OD (scored)

→ Issues & Management?

Issues - Management

- IV-PO misconnection colimycin-mercaptopurine?
  - use only oral-enteral syringes
  - extemporaneous preparation
  - clear labeling

- Toxicity for operator?
  - crushing of mercaptopurine under LAF conditions
  - closed-system delivery
  - gloves and mouth-mask for colimycin manipulation
Case 7

- Boy, 3 yrs, 25 kg
- Paediatric Intensive Care Unit
- History: none
- Problem: Supraventricular Tachycardia
- **R/ sotalol 6 mg TID**
  **furosemide 40 mg BID**

- Issues/management?
- Note: commercially-available formulations (Belgium)
  - sotalol 160 mg tablet direct-release, IV amp. 40 mg/4 ml
  - furosemide tablet 40 mg and 500 mg direct-release,
    caps. 30 mg Prolonged release, amp. 20 mg/2 ml and 250 mg/25 ml

→ Issues & management ?

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Issues - Management

- **Sotalol administration ?**
  - ➢ oral preparation by pharmacy (no fractioning !)
  - ➢ IV sotalol not an option in children !

- **Light sensitivity of furosemide?**
  - ➢ extemporaneous administration
  - ➢ opaque capsules

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Therapeutic plan & Medication review – looks into:

- Purpose of each medication
- Medication history
- Medicines without a verified indication
- Drug-disease contraindications /precautions
- Drug-drug interactions
- Patient/carer understanding
- Patient compliance - Dose intervals
- Dose timings in relation to food & lifestyle
- Dose-related toxicity
- Clinical and/or lab markers of treatment progress
- Evidence of safety/absence of unwanted drug effects
- Suspected toxicity & recording of ADRs
- Clinical outcome (includes sub-optimal control of symptoms)

Alternatives

- Review the need
- Hold temporarily
- Discuss NPO
- Change PO to other route
  - IV but also
dermal, sublingual, rectal
  etc.

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Patient with following R/ventilated + NGT

- Nifedipine LA 30 mg OD
- Valproate EC 200 mg BID
- Lithium 250 mg BID
- Isosorbide Mononitrate SR 120 mg OD
- Ferrous sulphate SR 325 mg OD
- Furosemide 40 mg OD
- Diclofenac SR 75 mg BID
- Amitriptyline 75 mg nocte
- Propranolol SR 80 mg PD
- Quinapril 10 mg BID

→ Issues & management?
Possible new RX

- Nifedipine LA 30 mg → Amlodipine 5 mg
- Valproate EC → Valproate Liquid
- Lithium 250 mg = Lithium 250 mg (fluid intake !)
- Isosorbide MN SR 120 mg → GTN Patch 10 mg
- Ferrous sulphate SR 300 mg (60 mg of iron) → Iron liquid (or injection)
- Furosemide 40 mg → Furosemide + potassium (or another K sparing diuretic)
- Diclofenac SR 75 mg BID → Diclofenac 50 mg TID + careful monitoring
- Amitriptyline 75 mg → Fluoxetine 40 mg OD
- Propranolol SR 80 mg CR → Atenolol 100 mg
- Quinapril 10 mg = Quinapril 10 mg

Therapeutic plan multidisciplinary approach

For patients with

- swallowing difficulties
- feeding tubes

+ Involve prescriber, nurse, dietitian, patient/carer

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You as educator

- Evaluate current knowledge of target group
- Develop training plan
- Convey messages clear and simple
- Ensure backup information source
- Re-evaluate and re-train as needed

Role of multidisciplinary team

- Pharmacist to “educate” healthcare staff
- Produce local guidelines & audit
- Discharge plan and educate patients & their carers
How?

- Introduction
- Legal-ethical issues
- Responsibilities – therapeutic issues for healthcare providers
- Case studies focusing on therapeutic issues → active involvement of participants → best practice info by WS moderators
- Evaluate & plan training needs in your working environment
- Q & A
- Conclusion

Some available data

“Quality improvement of oral medication administration in patients with enteral feeding tubes”
by van den Bemt PMLA et al. from the Netherlands
in Qual Saf Health Care 2006;15:44-47

“Improving oral medicine administration in patients with feeding tubes and swallowing problems”
by Hanssens Y et al. from Qatar
in Ann Pharmacother 2006;40:2142-2147

“Knowledge & practice regarding crushing medication at an otorhinolaryngology ward”
by Moerman N et al. from Belgium
at ESCP 25-27 Oct 07, abstract 0173 (PF)
Quality improvement of oral medication administration in patients with enteral feeding tubes

van den Bemt PMLA et al.
Qual Saf Health Care 2006;15:44-47

- Intervventional study – the Netherlands
- Interventions
  - daily ward visits by pharmacy technicians
  - “enteral feeding CI” in pharmacy program
  - “do not crush” icon on unit dose labels
  - setting up a database of oral dosage forms
  - detailed working instruction for nurses
  - short version of instruction on the medication cart (five golden “tube rules”)
  - stamp with text “enteral feeding tube”

Mean end points for both hospitals: comparison before and after interventions

<table>
<thead>
<tr>
<th>End point</th>
<th>Hazard ratio (hospital I) or odds ratio (hospital II)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No of obstructions related to days of tube feeding (after intervention vs before)</td>
<td>0.22</td>
<td>0.047 to 1.05*</td>
</tr>
<tr>
<td>No of problem drugs related to days of tube feeding (after intervention vs before)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hospital II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration errors per nurse (after intervention vs before)</td>
<td>0.003</td>
<td>0.0005-0.02</td>
</tr>
<tr>
<td>Administration errors per patient (after intervention vs before)</td>
<td>0.005</td>
<td>0.0003-0.072</td>
</tr>
</tbody>
</table>
### Classification of administration errors in hospital II

<table>
<thead>
<tr>
<th>Error Description</th>
<th>Before intervention (% of 96 administrations)</th>
<th>After intervention (% of 87 administrations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No error</td>
<td>23 (24)</td>
<td>82 (93)</td>
</tr>
<tr>
<td>Enteral feeding tube not flushed before administration of first drug</td>
<td>11 (11)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Drug crushed that may not be crushed</td>
<td>26 (27)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Mixing of different drugs when crushing or dispersing</td>
<td>36 (38)</td>
<td>3 (3)</td>
</tr>
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van den bert PMLA et al. Qual Saf Health Care 2006

WS SIG MI 25.10.07

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### Improving oral medicine administration in patients with swallowing problems and feeding tubes

Hanssens Y et al. Ann Pharmacother 2006; 40:2142-2147

- Questionnaire to 144 ICU nurses in Hamad Medical Corporation Doha – Qatar

- Assessment of knowledge & current practice
Codes used for “Sustained Release”

- Chrono
- CR
- CRT
- EC
- LA
- MR
- ® retard
- SA
- SR
- TD
- TR
- XR
- XL

LA and SR as

a. Capsule
b. Granules
c. Syrup
d. Tablet

Hanssens Y. et al. Ann Pharm. 2006
WS SIG MI 25.10.07
LA and SR means that the drug

a. Can be given at any time of the day  

b. Is gradually released over time  65 %  
c. Does not interact with food  
d. Should be taken once daily only  
e. None of the above

Best practice for NGT & PEG (i.e. feeding tubes)

- 46% ask for a liquid
- 43% consider interaction with feeding
- 46% do not open capsule
- 27% consider interaction with tube
- 60% do not mix with feeding
- 71% flush tube before and after
- 36% will also flush in between
- 44% administer correctly
- 83% flush after all drugs are given
Specific medicines through NGT/PEG - “correct”

Options:

a. Can be given at any time
(Flush + crush + give + flush)
b. Stop feeding 1 hr before + 1 hr after
c. Stop feeding 1 hr before + 2 hrs after
d. Not to be given through feeding tube

Hanssens Y. et al. Ann Pharm. 2006

Specific medicines through NGT/PEG - “correct”

Ciprofloxacin tablet 5%
Nifedipine retard 18%
Phenytoin suspension 33%
Digoxin tablet 35%
Iron syrup 47%
Furosemide tablet 53%

Hanssens Y. et al. Ann Pharm. 2006
Interventions

**Train the Trainers**

*Rx and labeling*

*Posters*

*Pamphlets*

*Lectures*

*Websites*

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**Evaluation of knowledge**

**Intervention plan**

Moerman N *et al.*

University Hospital, Leuven, Belgium

- Otorhinolaryngology ward
- Assessment of nurses’ knowledge of certain aspects of crushability
- 7- question survey

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Moerman N *et al.*

University Hospital, Leuven, Belgium
Evaluation of knowledge Intervention plan (cnt’d)

**Awareness**
- Purpose of controlled release formulations  
  93 % of the nurses
- Pharmaceutical codes related to prolonged activity (UNO, ZOK, LA)  
  53 % of the nurses
- Pharmaceutical codes related to slow release (RETARD and CR)  
  67 % of the nurses.
- Purpose of enteric coated drugs  
  26 % of the nurses

Not much attention to prevention of drug-nutrient and/or drug-tube interactions

Intervention plan has been developed
- information rounds
- poster related to the topic
- implementation of the use of a website developed by the Flemish Association of Hospital Pharmacists (www.pletmedicatie.be)

More info?
Poster session
Nathalie Moerman, Sarah Mertens, Ludo Willems
Pharmacy Department, University Hospital, Leuven, Belgium
Useful References


Food-drug interactions

Useful websites

- http://www.bapen.org.uk
  provides patient, gp & pharmacist guide and a practical guide chart
- http://www.swallowingdifficulties.com
- http://www.pletmedicatie.be (Flemish)
- http://www.hcuge.ch/Pharmacie/infomedic/utilismedic.htm (Switzerland, French)
- http://www.fda.gov/fdac/reprints/medtips.html
- http://www.rosemontpharma.com
Medicine administration to patients with feeding tubes & swallowing problems

How to improve knowledge and skills of healthcare providers & patients?

In Conclusion

Drugs & the enteral route

Consider

- Active substance
- Formulation
- Interaction with the feed
- Type, placement & size of tube
- Site of drug absorption
  ... Limited info

→ Monitor drug response
Legal issues ...

If a formulation is crushed or dissolved, the product is used as un-licensed ...

→ Prescriber **HAS** to add information such as

- NGT
- PEG/PEJ
- Swallowing problems
- Etc.

Overall ... and ... Always ...

Review Medication Administration principles
- Orders
- Prevention of errors
- Five rights
- Legal responsibilities
- Ethical responsibilities
Just keep in mind ...

• Every patient is different
• Every patient has different needs
• Pharmacists expected to provide this tailored advice
• Discuss with prescriber, nurse, patient/carer

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