To crush or not to crush?

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Overview

- Background
- Research
- Legal issues
- Crushing – Why is it a problem?
- Guidelines and where to get help

or

Background

- Why crush?
  - Many people are physically or psychologically unable to swallow tablets
  - Particularly in the paediatric and geriatric population
  - HOWEVER there are a limited number of liquid or dispersible preparations available
  - COST is also an issue with some of the alternative preparations not covered by the PBS, also consider ordering of duplicate dose forms eg changing from tablet to liquid antibiotics if tablets are not tolerated will require two scripts and incur two charges

Background

- Why crush?
  - Patients nil by mouth
    - Tube fed, fasting
  - Patients with dysphagia
    - Neurological –e.g. Stroke patients, Parkinson's Disease
    - Decreased consciousness, dry mouth, taste disturbance – Rx?
    - Swallowing deficits –short term vs long term
    - Large tablets vs small tablets, shape and coating or capsules
  - Patients resistive to care
    - Lack of insight
    - Timing of the dose
    - Resistive to certain carers
    - No longer want active treatment

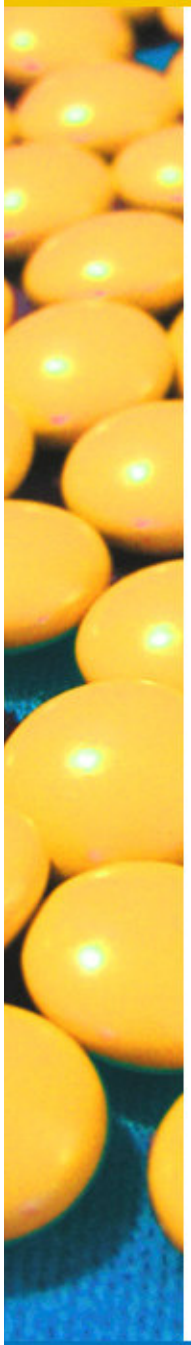
Research – Aged Care

- We know anecdotally that crushing or altering of medication is common
- South Australian research – documented the extent, the methods used and the types of medications which are modified.
  - Observation of medication rounds
- *"Crushing or altering medications: what's happening in residential aged care" Paradiso LM et al Aust J Ageing Vol21;3 2002*

Research – Aged Care

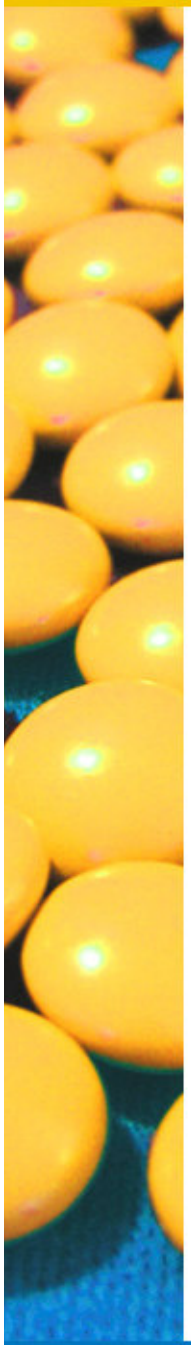
- Observed 1207 medication administrations at 10 different ACH & involved 586 residents

Type of facility	Number of facilities	Number of observations	% of observations where at least one medicine was altered
High Care	4	574	46%
Co-located	3	465	34%
Low Care	3	168	2%



Research – Aged Care

- Is this a problem?
  - **17%** of altered medications were deemed to have the potential to cause: ↑ Toxicity, ↓ efficacy, unpalatability, safety or stability concerns
  - In all occasions where > 1 medications was crushed they were crushed together
  - In **59%** of occasions where the same vessel was shared among residents it was not cleaned between residents
  - In **70%** of cases where alteration occurred spillage and thus loss of dose was observed



Research – Aged Care

- How was it administered?
  - 94% of altered medications were mixed with various media and given via a medication cup
    - Jam, vitamised fruit or custard, dispersing in water and flushing down a PEG tube
  - Only 2% were sprinkled over a residents meal
  - 16% of residents were not given any water with altered medications compared to only 1% when medications were given whole

Research - Aged Care

- Medications of concern that were crushed:

Levodopa (plain) 22.7%	Warfarin	Verapamil SR	Ferrous Sulphate
Digoxin	FGF®	Diclofenac EC	Perhexiline
Aspirin EC	Isosorbide Mononitrate (SR)	Diltiazem SR	Potassium Chloride
Carbamazepine	Nifedipine (normal +CR)	Omeprazole	Quinidine 0.7%
Dipyridamole SR	Felodipine ER	Quinine	
Levodopa CR	Morphine SR	Chlorpromazine	

Research – Aged Care

- Further work → attitudes of nursing staff
- Semi structured interviews with 11 RNs at the 10 ACHs
- Themes: making sure they get their medication, facing dilemma and uncertainty, inconsistency and contradiction, competing demands, time management, individualized needs/wants and cost/availability of alternative formulations
- Limited information, informal communication with healthcare professionals
- *"Making sure the residents get their tablets: medication administration in care homes for older people" Barnes L et al J Advanced Nursing 56(2):190-9, 2006 Oct*

Research - Aged Care

- Conclusions → Guidelines required

Research - Community

- UK study by Community Pharmacists
- 792 patients > 60 years old
  - 60% experienced difficulty in swallowing tablets or capsules
  - Similar number reported opening capsules or crushing tablets
  - Unaware of the negative effects this may have on the activity of the drug

- Strachan I and Greener M cited in *Consensus Guideline on the medication management of adults with swallowing difficulties*

http://www.swallowingdifficulties.com/Swallowing_difficulties_full.pdf *accessed 15/05/07*

Research - Hospitals

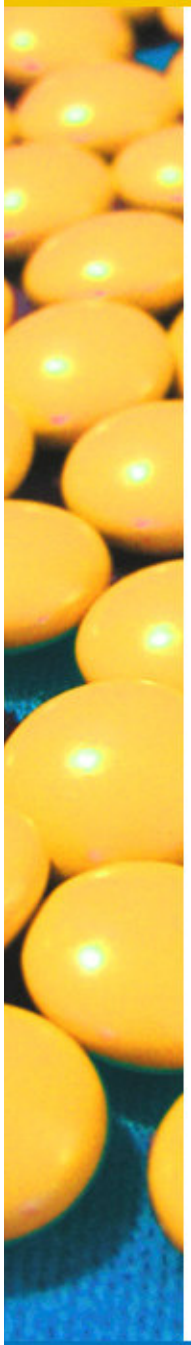
- Queensland research
- 97 QLD Health Hospitals, rural and metropolitan contacted 38 replied
- Nurse administration
- Of those altered
  - Mainly adults, on a daily basis
  - 75% crushed tablets, 17% opened capsules
  - 70% → >1 medication mixed together
  - Combined with Jam, honey, water, peanut butter, food
  - Large proportion shouldn't have been altered

- Nissen L M et al *Crushing or altering medications: what's happening in our local public hospitals?* PSA QLD Pharmacy Research Trust final report Aug 2006

Legal Issues

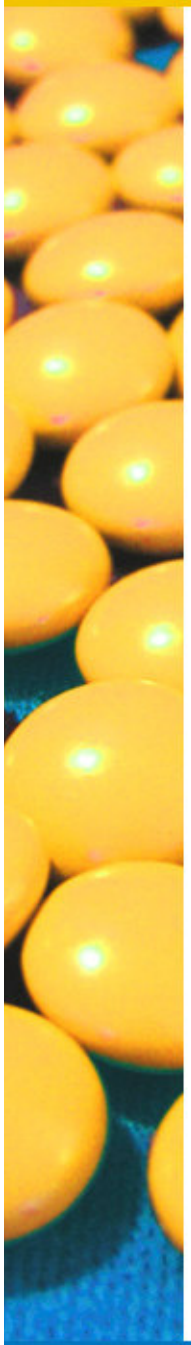
- Medication administration best practice
  - 5Rs – right medication, right person, right time, right dose, right form/route

- Crushing or altering non-chewable or crushable tablets/capsules = **off label or unlicensed use**



Legal issues

- **WHY?**
  - Potential to change the absorption characteristics of the preparation
  - Coatings may be used to cover taste, protect from light, EC/EN products designed to release product beyond the stomach
  - Controlled release tablets/capsules



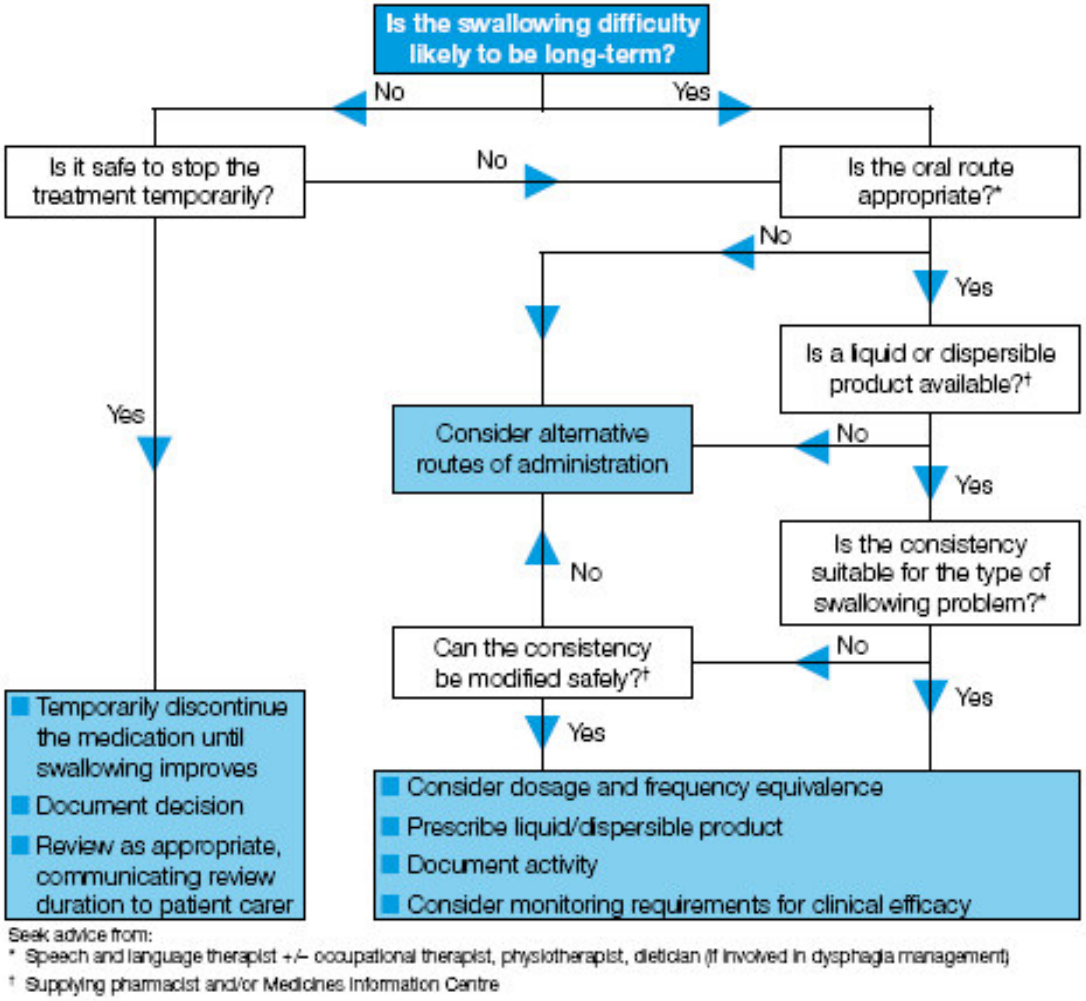
Legal Issues

- Liability lies *solely* with the nurse if unauthorised and is *shared* with the prescriber and pharmacist offering advice if authorised

- Liability is minimized by:
  - Clear documentation of the reasons why dose forms need to be altered
  - Following evidence- based, safe and effective practice

DOCUMENT and **COMMUNICATE**

Algorithm for the medication management of adults with swallowing difficulties



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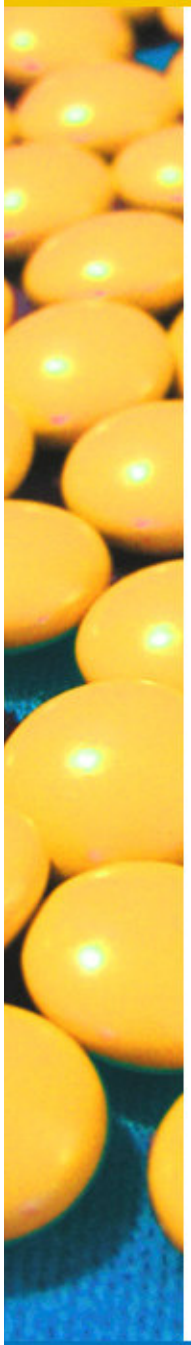


Alternatives

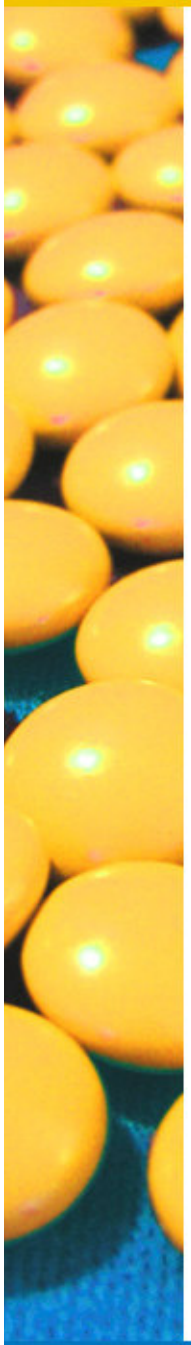
- Consider alternative routes of administration or formulations:
  - Chewable/dispersible
  - Liquid
  - Buccal
  - Sublingual
  - Transdermal
  - Injectable
  - Rectal
  - Intranasal

- Remember that changing the formulation may also change the:
  - Bioavailability
  - Efficacy
  - Side effect profile
- Eg Phenytoin

Phenytoin sodium 100mg

≈ phenytoin 92mg

Phenytoin capsules and injection contain phenytoin sodium BUT tablets and suspensions contain phenytoin

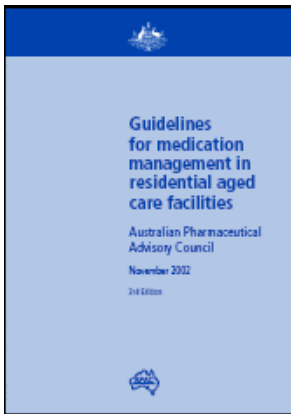


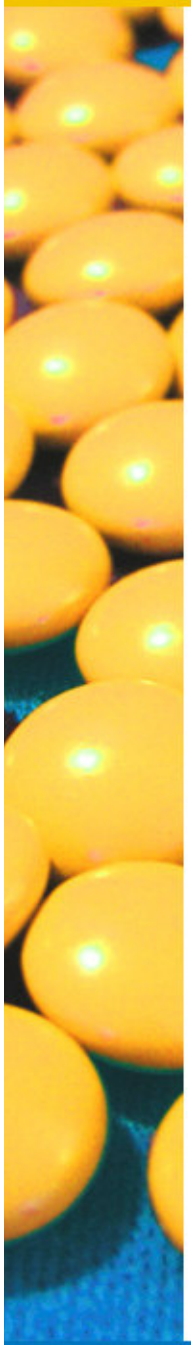
Alternatives?

- If alternative route not available
  - Consider an alternative agent for the indication
  - Review therapy – discontinue ?
  - **Altering the solid dose formulation**

Best Practice Guidelines

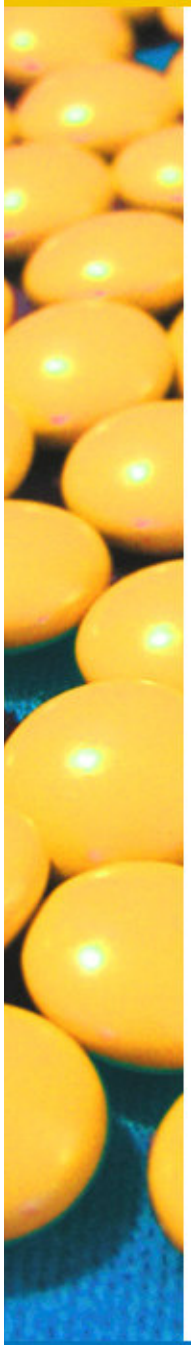
- *"Guidelines for medication management in residential aged care facilities"*
  - Australian Pharmaceutical Advisory Council (APAC) November 2002





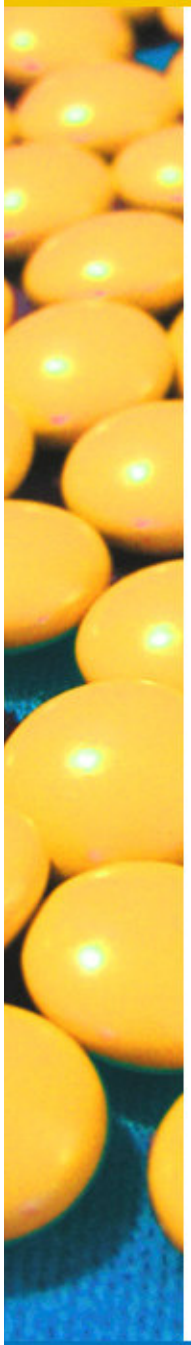
Best Practice Guidelines

- Recommendation 8
  - *Alteration of oral formulations*
  - *Each facility should have procedures for the alteration of dosage forms necessary to facilitate administration to certain residents. The MAC should endorse such procedures.* » *Appendix F*



APAC Guidelines – Appendix F

- **SIX** steps to best practice
- **SIX** areas of concern when altering formulations



Best Practice

A) Assessment of swallowing ability

B) Review of medication management and regimen

C) Which formulations should not be crushed?

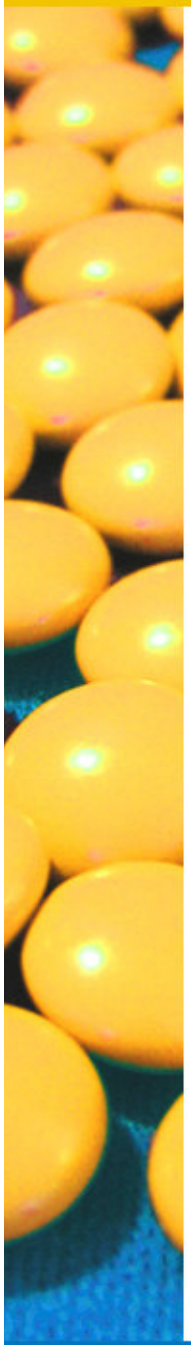
D) Suitable techniques for crushing

E) Administration to the resident

F) Monitoring and assessment

Altering formulations

1) Altered absorption characteristics
2) Medication stability
3) Local irritant effect
4) Failure to reach site of action
5) Occupational heath and safety
6) Unacceptable/ undisguisable taste



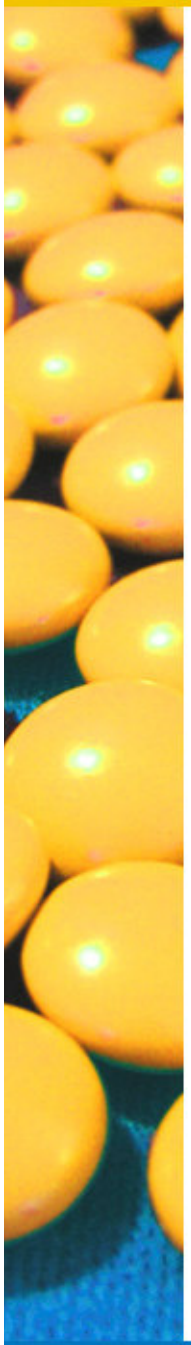
1.Altered absorption characteristics

- Crushing of tablets alters absorption characteristics

- E.g. Slow release formulations
  - Crushing destroys sustained release ability
  - Some can be halved but not crushed
  - SR capsules often contain coated pellets which can be sprinkled onto food or given down tube **not** crushed
  - Dose dumping
    - Eg SR verapamil crushing » ↑ hypotension, bradycardia
    - Change to standard tablets 3 x day then crush

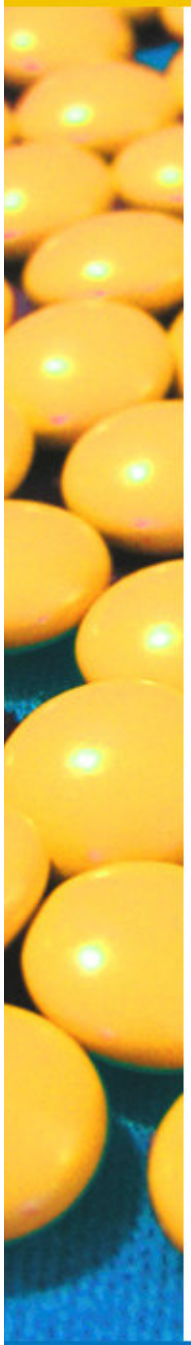
1.Altered absorption characteristics

- Slow Release?
  - SR slow release, sustained release
  - SA sustained action
  - CR/CRT controlled release/ tablet
  - LA long acting
  - MR modified release
  - TD/TR time delay/ timed release
  - XL extended length
  - XR/ER extended release
  - OROS® - patented osmotic release oral system
  - Contin



2. Medication stability

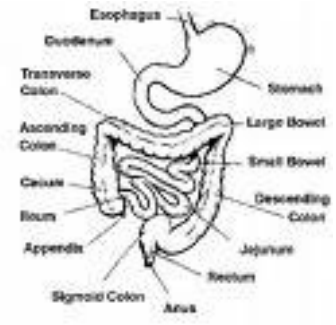
- Some tablets are sugar or film coated to protect from light
- If crushed must be administered ASAP
  - Eg nifedipine – even brief exposure to light » degradation
- Some tablets are acid labile
  - Eg omeprazole exposure to acid » degradation
    - Note the tablets (Losec® and Acimax®) may be allowed to disperse in yoghurt or OJ but do not crush
- Incompatible medications
  - Eg ciprofloxacin, tetracycline, alendronate, risedronate and calcium



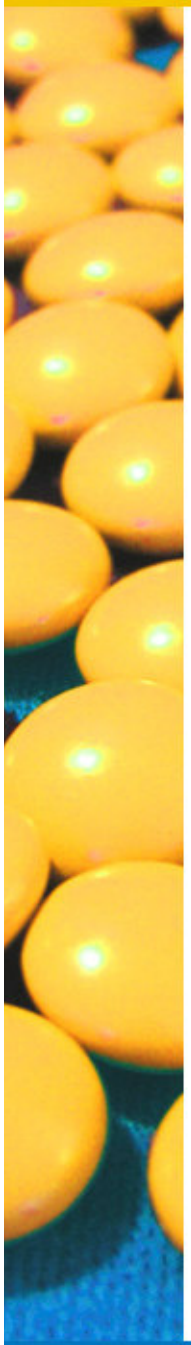
3. Local irritant effect

- Medications that are irritant to the oesophagus and/or stomach
- Often labelled EC/EN or may be sustained release
  - Eg aspirin (EC – Cartia®)
- Also consider those medications which » ulceration
  - Alendronate, risedronate, doxycycline, NSAIDs

4. Failure to reach site of action



- Some preparations are designed to release into a specific part of the GI tract
- Eg mesalazine (Mesasal®) resin formulation which dissolves and releases active drug to the lower small intestine » local anti-inflammatory action
  - Crushing will result in earlier release and absorption and ↓effect and ↑risk of kidney damage
- Loss during crushing process



Narrow therapeutic index

- Medicines where the gap between good and evil is small
- Should only be altered with caution and consistently
- Ensure the entire dose is given e.g.:

Amiodarone	Perhexiline
Carbamazepine	Phenytoin
Digoxin	Primidone
Levodopa (normal release)	Sodium Valproate
Lithium	Warfarin

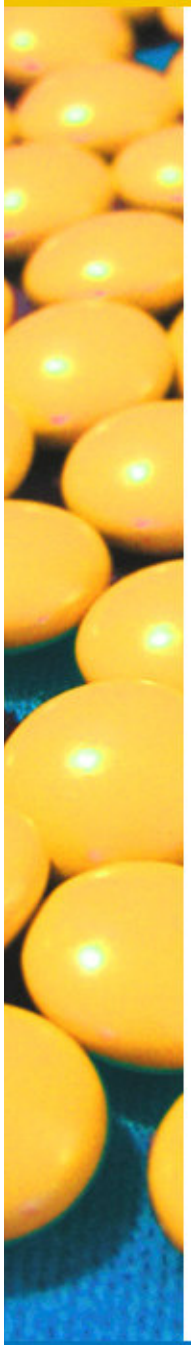
- *"Crushing or altering medications: what's happening in residential aged care" Paradiso LM et al Aust J Ageing Vol21;3 2002*

5. Occupational Health and Safety

VS

- Medications requiring special precautions include cytotoxic medications (eg methotrexate), hormonal preparations, skin irritants, teratogens
- Review need for medication and ensure staff are adequately trained before handling
- If using mortar and pestle crush tablets in a plastic bag to minimise dust
- Staff must wear mask and gloves
- Use dedicated “cytotoxic only” equipment

- Also consider ergonomics and staff repeatedly crushing medications
- Position on waist high bench or table to ensure comfortable working posture is obtained



6. Unacceptable/ undisguisable taste

- Quinine exceptionally bitter taste , also coloxyl with senna, Slow K– crushing won't alter effectiveness but may compromise compliance

- Consider what medium you are using to mix with crushed tablets to aid administration
  - Eg tablets which must be taken away from dairy products/ calcium – alendronate, risedronate, ciprofloxacin, tetracyclines, ketoconazole should not be mixed with yoghurt, custards or mousse

Research Aged Care

- Medications of concern that were crushed:

Levodopa (plain) 22.7%	Warfarin	Verapamil SR	Ferrous Sulphate
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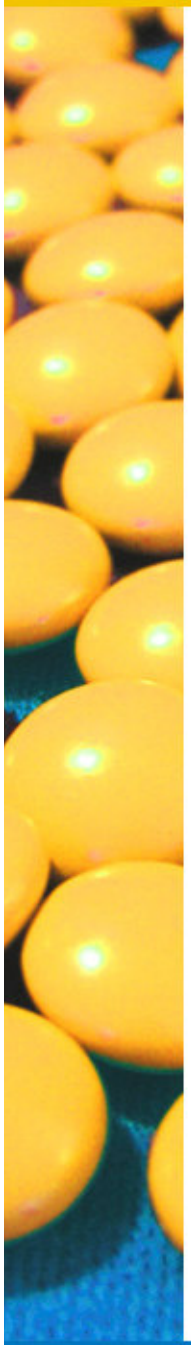
Dipyridamole SR	Felodipine ER	Quinine	
Levodopa CR	Morphine SR	Chlorpromazine	

Suitable technique

- Equipment allows for complete recovery of crushed medication
- If shared it must be washed and dried between residents
- Adequate training and dedicated set of equipment for cytotoxics
- Crush tablets first then add contents of capsules – do not crush individual beads
- Mix with small amount of food
- Give as soon as possible to reduce interactions and risk of medication incidents

Summary

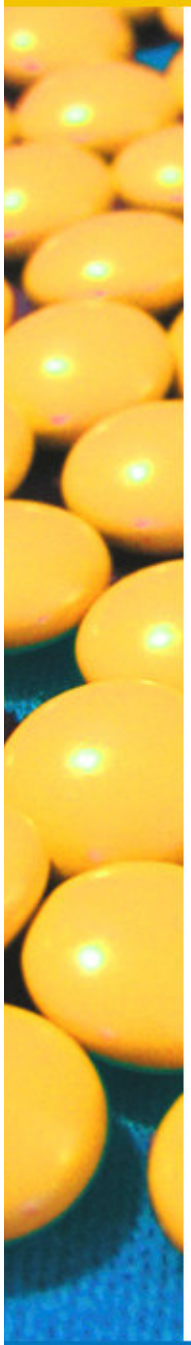
- Consider incompatibilities between tablets and/or medium used to administer
- Most cases multiple tablets may be crushed together then add powder or granules from capsules
- Good practice is essential to ensure accurate and consistent amounts of drug are given, do not mix over meals
- Ensure patients are as upright as possible and given sufficient (appropriate) fluid
- Clean equipment between patients



Summary

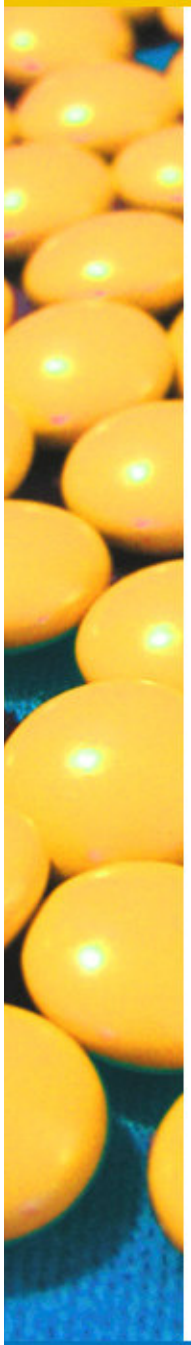
- **Document and communicate**

  - Ensure SR preparations are annotated as such
  - Consider use of stickers on medication charts
  - Ensure swallowing ability is communicated to supply pharmacy and updated as patient requirements change
  - Do all tablets need to crushed or just large ones?
  - Include details in care plans when transferring patients from Aged Care Homes to hospital



Summary

- **Develop protocols and drug checklist for staff**
  - **Refer to APAC Guidelines and develop a local protocol**
  - **Ask your Pharmacist to provide a list of medications that should not be crushed**



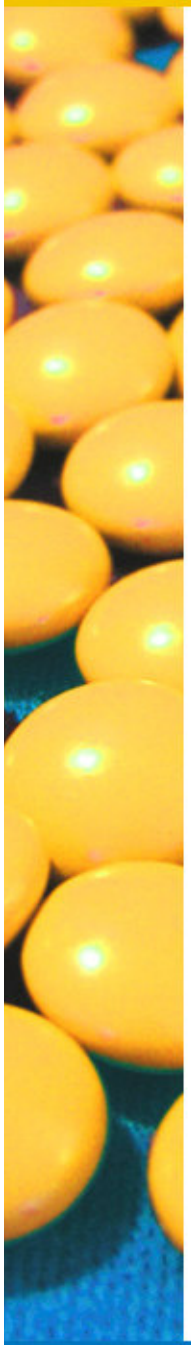
Summary – swallowing problems

- Speech pathology review if available
- Nil by mouth – unsuitable for oral route
- Thickened fluids – Med^{n} that require dissolving in water or taking with thin fluids not suitable
- Semi-thick, thick or extra thick – most liquid forms are not suitable
- Vitamised or minced diet – crushed med^{n} may be ok but swallow whole (SR) are contraindicated
- Soft chopped diet – may manage small pills or larger ones cut in half, whole tablets may be difficult

Guidelines and where to get help

- APAC Guidelines
- Australian Medicines Handbook Aged Care Companion
- Pharmacist
- MIMS, APF
- NPS – Therapeutic Advice and Information Service (TAIS) Telephone: 1300 138 677 (local call charge)
- http://www.swallowingdifficulties.com
- Enteral tube feeding http://www.bapen.org.uk
- Handbook of drug administration via enteral feeding tubes (PSA or Ramsay Books)


Any Questions?



References

- APAC Guidelines for medication management in residential aged care facilities, November 2002 http://www.health.gov.au/internet/wcms/publishing.nsf/Content/nmp-pdf-resguide-cnt.htm
- AMH Drug Choice Companion Aged Care, Second Ed 2006
- *"Crushing or altering medications: what's happening in residential aged care" Paradiso LM et al Aust J Ageing Vol21;3 2002*
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- Gowan J and Roller L, *Swallowing difficulties- and crushing medications* The Australian Journal of Pharmacy, 2006, 87:59-64
- www.swallowingdifficulties.com
- www.bapen.org.uk

Additional resources:

- MIMS, APF
- White R, Bradnam V *Handbook of Drug Administration via Enteral Feeding Tubes*, Pharmaceutical Press 2007
- Drug Company Medical Information Departments

TABLE 1: *What happens when tablets and capsules are crushed?*

Category *Generic name (Trade)*	
Antihistamines	
Dexchlorpheniramine (Polaramine Repetabs),	1
Pheniramine (Avil Retard)	1
Dexchlorpheniramine/pseudoephedrine (Demazin Day Night relief)	1
Analgesics	
Morphine sulphate (MS Contin)	1
Oxycodone (Oxycontin)	1
Antibiotics	
Cefaclor (Ceclor CG, Keflor CD)	1
Amoxycillin & Clavulanic acid (Augmentin Duo, Calmoxyl Duo)	1 & 2
Doxycycline (Doryx, Doxsig, Doxy-50, Doxy-100, Doxyhexal, Doxylin, Vibramycin, Vibratabs)	3
Erythromycin (EES, E-Mycin, Eryhexal, Erythrocin, EMU V, Eryc)	1
Nitrofurantoin (Furadantin, Macrodantin)	3
Cardiovascular medications	
Isosorbide mononitrate (Imdur, Duride, Imtrate, Mondur)	1
Indapamide 1.5mg (Natrilix SR)	1
Felodipine (Agon SR, Felodur SR, Plendil ER)	1
Nifedipine (Asalat, Adalat Oros, Nifecard, Nifehexal, Nyefax, SBPA Nifedipine)	2
Nimodipine (Nimotop)	2
Verapamil (Cordilox SR, Isoptin SR, Anpec SR, Veracaps SR)	1
Quinidine (Kinidin Durules)	1
Aspirin enteric coated (Cartia. Astrix 100)	3
Glyceryl trinitrate sub lingual (Anginine)	1
Dipyridamole SR (Asasantin SR, Persantin SR)	1
Haemantinics	
Iron containing products (Ferrogradumet, Fergon, FGF, Ferritard, Fefol)	3
Gastrointestinal	
Olsalazine (Dipentum), mesalazine (Mesasal), sulphsalazine (Salazopyrin)	4
omeprazole (Losec, Acimax,), lansoprazole (Zoton) , pantoprazole (Somac)	2
Pancreatic supplements	
Pancrease, Cotazym, Creon	4
Immune modulators	
Cyclosporin (Neoral)	6
Oral cytotoxic agents	5
altretamine (Hexalen), cyclophosphamide (Cycloblastin) levamisole (Ergamisol), etoposide (Vepesid), hydroxyurea (Hydrea), idarubicin (Zavedos), methotrexate (Ledertrexate, Methoblastin), chlorambucil (Leukeran), busulphan (Myleran), mercaptopurine (Purinethol), melphalan (Alkeran), capecitabine (Xeloda), temozolomide (Temodal)	
Anti Parkinson's Disease	
Levodopa controlled release (Sinement CR, Madopar HBS))	1
Psychoactive medications	
Chlorpromazine	5
Respiratory	
Theophylline controlled release (Nuelin SR, Theodur)	1
Endocrinology	
Alendronate (Fosamax)	3
Anti-inflammatory agents	
Sustained release naproxen (Naprosyn SR, Proxen SR)	1
Diclofenac enteric coated (Arthrotec, Diclohexal, Dinac, Fenac, Voltaren)	3
Electrolyte	
Sustained release potassium chloride (K-SR, Slow K)	3
Miscellaneous	
Isoretinoin (Roaccutane)	3 & 5
Phenytoin (Dilantin)	1
Quinine sulphate (Quinate, Quinoctal, Quinsul)	6
Quinine Bisulphate (Biquinate, Myoquin, Quinbisul)	6

Legend
1. Altered absorption characteristics
2. Medication instability
3. Local irritant effect
4. Failure to reach site of action
5. Occupation health and safety
6. Unacceptable/undisguisable taste