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Formulary 2009-2011



**An Essential Medicines Dosing Guide
Based on the WHO Model Formulary**

EYE

WHO MODEL FORMULARY 2008 NOTES:

Preparations for the eye should be sterile when issued. Use of single-application containers is preferable; multiple-application preparations include antimicrobial preservatives and when used particular care should be taken to prevent contamination of the contents, including the avoidance of contact between the applicator and the eye or other surfaces. Eye drops are generally instilled into the lower conjunctival sac which is accessed by gently pulling down the lower eyelid to form a pocket into which one drop is instilled. The eye should be kept closed for as long as possible after application, preferably 1-2 minutes. A small amount of eye ointment is applied similarly; the ointment melts rapidly and blinking helps to spread it. When two different eye drops are required at the same time, dilution and overflow may occur when one immediately follows the other; an interval of 5 minutes should be allowed between the two applications. Systemic absorption, which may occur after topical application of eye drops, can be minimized by using the finger to compress the lacrimal sac at the medial canthus for at least one minute after instillation of the drops. This helps block the passage of the drops through the naso-lacrimal duct.

SKILLED TASKS. Application of eye preparations may cause blurring of vision which is generally transient; patients should be advised not to carry out skilled tasks such as operating machinery or driving until their vision has cleared.

9.01 ANTI-INFECTIVE EYE PREPARATIONS

WHO MODEL FORMULARY 2008 NOTES:

Blepharitis, conjunctivitis, keratitis and endophthalmitis are common acute infections of the eye and can be treated topically. However, in some cases, for example, in gonococcal conjunctivitis, both topical and systemic anti-infective treatment may be necessary. Blepharitis and conjunctivitis are often caused by staphylococcus, while keratitis and endophthalmitis may be bacterial, viral or fungal. Bacterial blepharitis is treated with an antibacterial eye ointment or drops. Although most cases of acute bacterial conjunctivitis may resolve spontaneously, anti-infective treatment shortens the infectious process and prevents complications. Acute infective conjunctivitis is treated with antibacterial eye drops by day and eye ointment applied at night. A poor response may indicate viral or allergic conjunctivitis. Keratitis requires immediate specialist care.

Aciclovir is an antiviral used in the treatment of keratitis due to herpes simplex virus. Lesions usually heal after 5–9 days of treatment. For systemic treatment with antivirals, such as aciclovir, see section 6.06.

Gentamicin is a broad-spectrum bactericidal aminoglycoside antibiotic with particular activity against *Pseudomonas aeruginosa*, *Neisseria gonorrhoea* and other bacteria that may be implicated in blepharitis or conjunctivitis. Topical application may lead to systemic absorption and possible adverse effects.

Tetracycline is a broad spectrum antibiotic with activity against many Gram-positive and negative bacteria including *N. gonorrhoea*, and most chlamydia, rickettsia, mycoplasma and spirochetes. Ophthalmic tetracycline is used in blepharitis, conjunctivitis, and keratitis produced by susceptible bacteria. Tetracycline is also used in the treatment of trachoma caused by *Chlamydia trachomatis* and in the prophylaxis of neonatal conjunctivitis (ophthalmia neonatorum) caused by *N. gonorrhoea* and *C. trachomatis*.

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Aciclovir Eye Ointment 3%, 4.5g (Zovirax) [Acyclovir]	IDA EML	Herpes Simplex keratitis: Adult & Child, <i>Apply</i> 1cm of ointment 5 times daily, continue for at least 3 days after complete healing.
Chloramphenicol Eye Drops 0.5% 10ml Eye Ointment 1% 5g (CMC, Chloromycetin) [Contains thiomersal]	IDA	Eye drops: <i>Apply</i> 1-2 drops at least every 2 hours then reduce frequency as infection is controlled and continue for 48 hours after healing. Eye ointment: <i>Apply either</i> at night (if eye drops used during the day) or 3-4 times daily if used alone.
Ciprofloxacin Eye Drops 0.3% 10ml (Ciloxan) [Contains benzalkonium chloride]	MSL	NOT for Child < 1 yo. Bacterial infection: <i>Apply</i> 1-2 drops at least every 2 hours, reduce to 3-4 times daily as infection is controlled, continue for 48 hours after healing. Corneal ulcer: <i>Apply</i> throughout day and night, first day 2 drops every 15 minutes for 6 hours then every 30 minutes, day 2 apply 2 drops every hour, days 3-14 apply 2 drops every 4 hours, max duration 21 days.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Gentamicin Eye Drops 0.3% 5ml <i>[Contains benzalkonium chloride]</i>	IDA EML	Adult/Child, <i>apply</i> 1-2 drops every 2 hours, reduce frequency to 3-6 times daily as infection is controlled and continue for 48 hours after healing.
Neomycin 3500 units & Polymixin B 6000 units & Dexamethasone 0.1% / ml Eye Drops, 5ml (Maxitrol) <i>[Contains benzalkonium chloride]</i>	MSL	Adult/Child, <i>apply</i> 1-2 drops every 2 hours, reduce frequency to 4-6 times daily as infection is controlled and continue for 48 hours after healing.
Tetracycline Eye Ointment 1% 3.5g (Terramycin)	MSL EML	Bacterial infection: Adult/Child > 8 yo, <i>apply into the conjunctival sac of the affected eye</i> 3-4 times daily. Trachoma continuous intensive treatment: Adult/Child 1 <i>application</i> into each eye twice daily for 6 weeks
Tobramycin Eye Drops 0.3%, 5ml Eye Ointment 3.5g (Tobrex) <i>[Contains benzalkonium chloride]</i>		Eye drops: <i>Apply</i> 1-2 drops every 4 hours, reduce frequency as infection is controlled and continue for 48 hours after healing. Eye ointment: mild to moderate infection, <i>Apply</i> 2-3 times daily; severe infection, <i>Apply</i> every 3-4 hours until improvement then reduce frequency.
Tobramycin 0.3% with Dexamethasone 0.1% Eye Drops 5ml, Eye Ointment 3.5g (Tobradex) <i>[Contains benzalkonium chloride]</i>		Adult/Child > 2 yo, Eye drops: <i>Apply</i> 1-2 drops 4 hourly reduce frequency as infection is controlled and continue for 48 hours after healing. Eye ointment: <i>Apply</i> a half-inch of ointment 4 hourly or at night only if eye drops are used in the daytime.
Trifluridine 1% Eye Drops 5ml (Viroptic) <i>[Contains thiomersal]</i>		Herpes Simplex keratitis: Adult/Child > 6yo, <i>Apply</i> 1 drop every 2 hours while awake to a max daily dosage of 9 drops until the cornea ulcer has completely re-epithelialized, then continue treatment for 7 more days of 1 drop every 4 hours (min daily dose 5 drops) recommended.

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COMMENT/CAUTIONS:

- **Eye drops or ointment** should be applied frequently in the acute phase of infection (at least 2 hourly unless otherwise directed), then reduce frequency as infection is controlled, continuing for 48 hours after healing.
- **Eye ointment:** A thin coating should be applied into the conjunctival sac of the affected eye 4 hourly, or at night only if using eye drops during the day.
- **Chloramphenicol:** drug of choice since allergic skin reactions are rare. However, do not give long term or use if family history of blood dyscrasias (rare aplastic anaemia side effects).
- **Antibiotics with corticosteroids** are primarily indicated for post-op use for risk of infection. **Dexamethasone 0.1%** should thus not be used without direct ophthalmologist supervision. Prolonged use may result in posterior subcapsular cataract formation and glaucoma in steroid-responding patients.
- **Tetracycline** eye drops/ointment is indicated for ocular trachoma but should be combined with oral tetracycline for a curative effect.
- DISCARD TOPICAL EYE PREPARATIONS 4 WEEKS AFTER OPENING FOR OUTPATIENTS AND 7 DAYS AFTER OPENING FOR INPATIENTS.

9.02 CORTICOSTEROID EYE PREPARATIONS

WHO MODEL FORMULARY 2008 NOTES:

Ophthalmic corticosteroids should only be used under supervision of an ophthalmologist as inappropriate use is potentially blinding. Dangers include the development of open-angle glaucoma (chronic simple glaucoma) and cataracts, and the aggravation of a simple herpes simplex epithelial lesion into an extensive corneal ulcer and subsequent permanent corneal scarring, with possible damage to vision and even loss of the eye. Corticosteroids such as **prednisolone** are useful in the treatment of inflammatory conditions including uveitis and scleritis. They are also used for reducing postoperative ocular inflammation. Before administration of an ophthalmic corticosteroid, the possibility of bacterial, viral or fungal infection should be excluded. Treatment should be the lowest effective dose for the shortest possible time; if long-term therapy (> 6 weeks) is unavoidable, withdrawal should be gradual to avoid relapse.

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Dexamethasone Eye Drops 0.1%, 10ml (as sodium phosphate)	MSL IDA	Apply 1 drop 4-6 times daily; if severe apply every 0.5-1 hour until controlled then reduce frequency.
Prednisolone Eye Drops 1%, 5ml (Pred-Forte) [Contains benzalkonium chloride]	EML	Inflammation of the eye: <i>By instillation into the eye</i> Adult & Child 1 drop every 1-2 hours, reducing frequency as inflammation is controlled.

COMMENT/CAUTIONS:

- Corticosteroids should be used under the supervision of an ophthalmologist. They are contraindicated in herpes simplex corneal ulceration. **Corticosteroids with antibiotics** are primarily indicated for post-op use for the risk of infection (see Section 9.01 above).
- **Prednisolone 1%** is the most potent followed by **dexamethasone 0.1%**. Use more potent items only for serious inflammation.
- DISCARD TOPICAL EYE PREPARATIONS 4 WEEKS AFTER OPENING FOR OUTPATIENTS AND 7 DAYS AFTER OPENING FOR INPATIENTS.

9.03 MIOTICS & ANTIGLAUCOMA MEDICINES

WHO MODEL FORMULARY 2008 NOTES:

Glaucoma is normally associated with raised intra-ocular pressure and eventual damage to the optic nerve which may result in blindness. The rise in pressure is almost always due to reduced outflow of aqueous humour, the inflow remaining constant. The most common condition is chronic open-angle glaucoma (chronic simple glaucoma) in which the intra-ocular pressure increases gradually and the condition is usually asymptomatic until well advanced. In contrast, angle-closure glaucoma (closed-angle glaucoma) usually occurs as an acute emergency resulting from a rapid rise in intra-ocular pressure; if treatment is delayed, chronic angle-closure glaucoma may develop. In ocular hypertension intra-ocular pressure is raised without signs of optic nerve damage.

Drugs used in the treatment of glaucoma lower the intra-ocular pressure by a variety of mechanisms including reduction in secretion of aqueous humour by the ciliary body, or increasing the outflow of the aqueous humour by opening of the trabecular network. Antiglaucoma drugs used include topical application of a beta-blocker (beta-adrenoceptor antagonist), a miotic, or a sympathomimetic such as epinephrine; systemic administration of a carbonic anhydrase inhibitor may be used as an adjunct.

Timolol is a non-selective beta-blocker that reduces the secretion of aqueous humour. A beta-blocker is usually the drug of choice for initial and maintenance treatment of chronic open-angle glaucoma. If further reduction in intra-ocular pressure is required a miotic, a sympathomimetic or a systemic carbonic anhydrase inhibitor may be used with timolol. In angle-closure glaucoma, timolol should be used with a miotic and not alone. Since systemic absorption can occur, an ophthalmic beta-blocker should not be used in patients with *asthma* or a history of obstructive airways disease, unless no alternative is available; in such cases precautions should be taken to guard against bronchospasm.

A miotic such as **pilocarpine** (parasympathomimetic action) contracts the iris sphincter muscle and ciliary muscle, and opens the trabecular network. It is used in chronic open-angle glaucoma either alone or, if required, with a beta-blocker, epinephrine or a systemic carbonic anhydrase inhibitor. Pilocarpine is used with systemic acetazolamide in an acute attack of angle-closure glaucoma prior to surgery; however, it is not advisable to use pilocarpine after surgery because of a risk of posterior synechiae forming. Systemic absorption of topical pilocarpine can occur producing muscarinic adverse effects.

The sympathomimetic drug **epinephrine** (adrenaline) probably acts by reducing the rate of production of aqueous humour and increasing the outflow through the trabecular network. Epinephrine is usually used with a miotic, a beta-blocker or a systemic carbonic anhydrase inhibitor in the treatment of chronic open-angle glaucoma; however, because epinephrine is also a mydriatic, it is contraindicated for angle-closure glaucoma unless an iridectomy has been carried out.

Acetazolamide, by reducing carbonic anhydrase in the eye, reduces the production of aqueous humour and so reduces intra-ocular pressure. It is used systemically as an adjunct in chronic open-angle glaucoma unresponsive to treatment with topically applied antiglaucoma drugs. Prolonged therapy with acetazolamide is not normally recommended, but if treatment is unavoidable blood count and plasma electrolyte concentration should be monitored. Acetazolamide is also used as part of emergency treatment for an acute attack of angle-closure glaucoma; however it should not be used in chronic angle-closure glaucoma as it may mask deterioration of the condition.

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Acetazolamide Tab 250mg (Diamox) [Carbonic anhydrase inhibitor (CAI)]	IDA EML	Chronic open-angle glaucoma, secondary glaucoma: <i>By mouth</i> , Adult 0.25-1 g daily in divided doses.
Acetylcholine Ophthalmic Injection 1% (Miochol)		To produce miosis: <i>Instil</i> 0.5-2ml of the 1% solution into the anterior chamber parallel to the iris face, tangential to pupil border.
Betaxolol Eye Drops 0.5%, 5ml (Betoptic) [Contains benzalkonium chloride]	D	Beta-blocker. <i>Apply</i> 1-2 drops twice daily.
Brinzolamide Eye Drops 1% (10mg/ml), 5ml (Azopt) [CAI] [Contains benzalkonium chloride]	D	Adjunct to beta-blocker or used alone for glaucoma: <i>Apply</i> 1 drop twice daily, up to max 3 times daily.
Carbachol Ophthalmic Injection 0.01% (Miostat)	D	To produce miosis: <i>Instil</i> 0.4-0.5ml into the anterior chamber.
Latanoprost Eye Drops 0.005% (50micrograms/ml), 2.5ml (Xalatan) [Contains benzalkonium chloride]	D	Prostaglandin analogue, for open-angled glaucoma and ocular hypertension patients intolerant or unresponsive to other medicines: <i>Apply</i> 1 drop in the evening.
Pilocarpine HCl Eye Drops 2%, 10ml [Contains benzalkonium chloride]	MSL EML	Chronic open-angle glaucoma: Adult <i>apply</i> 1 drop up to 4 times daily. Acute angle-closure glaucoma before surgery: Adult <i>apply</i> 1 drop every 10 minutes for 30-60 minutes, then 1 drop every 1-3 hours until intra-ocular pressure subsides.
Timolol Eye Drops 0.5%, 5ml (Timoptol) [Contains benzalkonium chloride]	IDA EML	Beta-blocker. Ocular hypertension, chronic open-angle glaucoma, aphakic glaucoma, some secondary glaucomas: Adult <i>apply</i> 1 drop 1-2 times daily.

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COMMENT/CAUTIONS:

- **Carbonic anhydrase inhibitors:** Use in patients resistant/contraindicated to beta-blockers. **Acetazolamide adverse effects** include drowsiness or malaise, hypokalaemia (long-term use).
- Cardioselective **beta-blockers** (e.g. betaxolol) are preferable to non-selective ones (e.g. timolol) in elderly/heart disease/asthma; but caution is still advised.
- **Latanoprost (Xalatan):** may cause brown pigmentation in the iris and change in eye colour.
- **Pilocarpine** causes difficulty with dark adaptation. Pupil sphincter spasm may cause pain on administration. Advise patients to be cautious in night driving or hazardous occupations and to not carry out skilled tasks until vision is clear.
- DISCARD TOPICAL EYE PREPARATIONS 4 WEEKS AFTER OPENING FOR OUTPATIENTS AND 7 DAYS AFTER OPENING FOR INPATIENTS.

9.04 MYDRIATICS & CYCLOPLEGICS

WHO MODEL FORMULARY 2008 NOTES:

Antimuscarinics, by blocking the cholinergic effects of acetylcholine, paralyse the pupillary constrictor muscles causing dilation of the pupil (mydriasis) and paralyse the ciliary muscles resulting in paralysis of accommodation (cycloplegia). Mydriasis may precipitate acute angle-closure glaucoma particularly in elderly or long-sighted patients. In patients with dark iridic pigmentation, higher concentrations of mydriatic drugs are usually required and care should be taken to avoid overdosing.

Atropine is a long-acting antimuscarinic used for cycloplegic refraction procedures, particularly in children. It is also used to immobilize the ciliary muscle and iris and to prevent formation of posterior synechiae in the treatment of inflammatory eye disorders such as iritis and uveitis.

Tropicamide is a short-acting relatively weak mydriatic that dilates the pupil and paralyse the ciliary muscle. It facilitates examination of the fundus of the eye.

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Atropine Sulphate Eye Drops 1%, 10ml <i>[Contains benzalkonium chloride]</i>	IDA EML	Refraction: Adult, <i>apply</i> 1 drop 1 hour before procedure. Iritis, uveitis: Adult, <i>apply</i> 1 drop up to 4 times daily; Child <i>apply</i> 1 drop up to 3 times daily.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Cyclopentolate Eye Drops 2%, 15ml (Cyclogyl) <i>[Contains benzalkonium chloride]</i>		Refraction: <i>Apply</i> 1-2 drops; Uveitis: <i>Apply</i> 1-2 drops 2-3 times daily.
Phenylephrine Eye Drops 2.5% & 10%, 10ml (Analux/Neosynephrine)	EML	Pupil dilation for examination, <i>apply</i> 1-2 drops as needed, Avoid or use 2.5% prep in patients with cardiovascular disease, avoid 10% preparation in children or elderly.
Tropicamide Eye Drops 1%, 15ml (Mydracyl) <i>[Contains benzalkonium chloride]</i>	IDA EML	Refraction: Adult/Child, 1 drop 15-20 minutes before examination of eye. Uveitis: 1 drop 2-3 times daily.

COMMENT/CAUTIONS:

- Relative potencies and duration of action: Tropicamide [3 hours], cyclopentolate [up to 24 hours], atropine [7 days or longer, so use only on ophthalmologist advice].
- SKILLED TASKS. May cause sensitivity to light and blurred vision. Patients should be advised to avoid carrying out skilled tasks e.g. operating machinery or driving, until vision is clear.
- **Atropine & Cyclopentolate** eye drops may cause systemic reactions in the very young or very old (monitor for cardiac/central nervous symptoms).
- DISCARD TOPICAL EYE PREPARATIONS 4 WEEKS AFTER OPENING FOR OUTPATIENTS AND 7 DAYS AFTER OPENING FOR INPATIENTS.

9.05 PERI-OPERATIVE EYE PREPARATIONS

GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Alcohol, Dehydrated Inj) (USP27)	D	Specialist use only. Inject 1ml (1cc) retrobulbar for relief of pain, see product leaflet for detail.
Apraclonidine HCl Eye Drops 0.5%, 5ml (Iopidine) <i>[Contains benzalkonium chloride]</i>	D	Control/prevention of postoperative elevation of intra-ocular pressure after anterior segment laser surgery: Adult, <i>Apply</i> 1 drop 1 hour before laser procedure then 1 drop immediately after completion of procedure. Child not recommended.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Balanced Salt Solution for Eye Irrigation, 500ml Eye Drops, 18ml (BSS & BSS Plus)		For intra-ocular and topical irrigation of the eye during surgical procedures.
Diclofenac Sodium Eye Drops 0.1%, 5ml (Voltaren Ophthalmic) [NSAID]		<i>Apply</i> 1 drop 4 times daily 24 hours after cataract surgery and continue for 2 weeks.
Fluorescein Disodium 0.4moles in H₂O Medium, Strips for Ophthalmic Use (Fluorescite)	MSL IDA EML	For diagnosis of corneal epithelial defects. For single use only, externally, <i>applied to the conjunctiva or conjunctival sac</i> where tears will dissolve the strip, then leave in contact for 5 seconds. Do not use on damaged eye tissue, and do not touch the fluorescein-coated tissue. See product leaflet for details.
Gonioscopic Lens Solution (Goniosol)	D	For use during laser procedures to improve visualization. See product leaflet for details.
Hyaluronate Sodium, Ophthalmic Injection, various strengths & molecular weights (e.g. Viscoat) [Viscoelastic agents]		<i>Inject</i> 0.5ml slowly and carefully into the anterior chamber during ophthalmic surgery. See product leaflet for details.
Hydroxypropylmethylcellulose Ophthalmic Injection 2% (Hypromellose Cellugel)		<i>Inject</i> into the anterior chamber during ophthalmic surgery. See product leaflet for details.
Lidocaine HCl Inj 1% 10mg/ml preservative-free (Xylocaine MPF) [Lignocaine]		Intraocular injection up to 0.3ml, see product leaflet for details. [Note. Other lidocaine preparations are listed in Chapter 13 Anaesthetics Section 13.02 Local Anaesthetics.]
Lubricant, Eye Ointment, various preparations (e.g. Lacrilube)		<i>Apply</i> a thin coating when needed, see product leaflet for detail.
Olopatadine Eye Drops 0.1%, 5ml (Patanol) [Contains benzalkonium chloride]	D	Allergic conjunctivitis: Adult/Child > 3yo, <i>Apply</i> one drop into each affected eye twice daily at an interval of 6-8 hours.

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GENERIC (TRADE) NAME	CAT.	INDICATION/DOSE
Povidone-Iodine Sterile Ophthalmic Prep Solution 5% (Betadine)		<i>Apply to eyelashes and lid margins using a sterile, cotton tip applicator using one or more applicators per lid; repeat once. To prep lids, brow and cheek, use a circular ever-expanding fashion until the entire field is covered; repeat prep 3 times. While separating the lids, irrigate the cornea, conjunctiva and palpebral fornices using a sterile bulb syringe; leave in contact for two minutes, then use sterile NS in a bulb syringe to flush away residual prep solution.</i>
Proparacaine Eye Drops 0.5%, 15ml (Ophthetic) <i>[Contains benzalkonium chloride]</i>		Local anaesthetic: <i>Apply</i> 1-2 drops as required.
Sodium Chloride Eye Drops 5% (Muro 128)	D	Post-cataract surgery for corneal oedema to restore vision and relieve pain: <i>Instil</i> 1-2 drops in the affected eye(s) every 3-4 hours, or as directed by eye surgeon.
Tears, Artificial, Eye Drops or Eye Ointment, various preps		<i>Apply</i> 1-2 drops several times daily, see product leaflet for details.
Tetracaine Eye Drops 0.5%, 5ml [Amethocaine]	MSL IDA EML	Local anaesthetic: Adult/Child <i>apply</i> 1-2 drops as required.
Trypan Blue Eye Solution 0.06% Prefilled-syringe (Vision Blue)		For management of poor visibility of the lens capsule during cataract surgery, 0.1-0.3ml as needed, see product leaflet for details.

COMMENT/CAUTIONS:

- **Anaesthetics:** Warn patients not to rub or wipe the anaesthetised eye(s) for at least 30 minutes after procedure. Respect the 'one inch' rule (distance between dropper & eye) to avoid cross-infection if a multi-dose bottle is used.
- **Fluorescein:** may cause temporary yellowish discoloration of skin and urine.
- **Tetracaine:** provides a rapid local anaesthesia which lasts for 15 minutes or more. Prolonged or unsupervised use is not recommended.
- DISCARD TOPICAL EYE PREPARATIONS 4 WEEKS AFTER OPENING FOR OUTPATIENTS AND 7 DAYS AFTER OPENING FOR INPATIENTS.