Doctors for Disaster Preparedness

A BASIC MEDICAL KIT FOR A 10-20 PERSON SHELTER

compiled by Jane M. Orient, MD, with assistance from many others

Patients often ask what medical and nutritional supplies they should store. This is a very good question; after a major natural or man-made disaster it might be easier to find some person with medical knowledge than to locate drugs and supplies. The question is very difficult to answer. Every physician would make a different list.

No physician today would like to find himself in the middle of the major disaster without certain drugs, equipment, and medical supplies. Unfortunately, all drugs are perishable. After the expiration date, they begin to lose their potency, and some (especially tetracycline) may contain toxic byproducts. This means that supplies should be rotated, increasing the cost of this type of "insurance." However, most of us, in a desperate emergency, would use outdated drugs in preference to none at all. Most drugs are good for years after their expiration date. In general, to prolong the effectiveness of most pills they can be ***vacuum sealed*** and stored in a cool, dry place (like the middle of the refrigerator). However, there is no universal rule regarding long-term storage of meds. Each medication is different, and one should follow the manufacturer recommendations about long term storage. This information is available on the manufacturer's website. Certain medications (like insulin) must be kept refrigerated all the time. Few medications (mostly vaccines) must be stored frozen. Unless specifically recommended by manufactures, liquid medications or gel caps should not be stored in the deep freezer.

Many simple medical devices (thermometers, blood pressure monitors), which required no batteries in the past, are now battery operated. While they are very convenient during peace time, they provide additional challenge during times of crisis when the availability of batteries may be limited. This necessitates having a good supply of batteries (which also have expiration date and should be rotated) or having rechargeable batteries and electric generators or solar panels. Whenever possible it would be advisable to secure the manually operated versions of such devices (e.g., manual sphygmomanometer, or glass mercury-free Galinstan operated thermometers, or old mercury thermometer—mercury thermometers are now banned in many countries, including U.S.).

Many people when preparing for a major natural or man-made crisis concentrate on collecting food, drugs, and supplies, and on building a solid shelter at their house or in some remote location. Those are certainly very important elements of preparedness.

However, ***mental preparation*** for the disaster is a prerequisite for survival. Unlike in normal conditions, during the crisis our ability to control our environment and our life will be very limited. It is imperative to remember the old military proverb: "***No battle plan ever survives first contact with the enemy. "***

Before starting "physical" preparations it is important to acknowledge that lack of control and limited options associated with any serious crisis will require enormous flexibility, adaptability, and resilience. Therefore, at minimum a person preparing for the major crisis must be mentally ready to abandon without hesitation valuable possessions including most of stored supplies and comfortable shelter. Sometimes there will be no option but to flee in a hurry.

PROPOSED LIST OF ITEMS FOR A MEDICAL KIT

In putting together your own kit, you will need to take your own family's situation into consideration. And you will need the cooperation of your physician for obtaining prescription drugs. One must also be aware of local and federal regulations that prohibit possession of various substances and pieces of equipment by the "unauthorized persons." Finally, you will need to consider how much you can afford to spend. Do not buy drugs and/or medical devices until the basics (food, water, ventilation, shelter, etc.) are provided. **Remember that the human race survived for many centuries without modern medicine, but could not survive more than a few days without water.**

No one can predict all possible crisis situations. However, in constructing this list, various assumptions are made about the most likely crisis scenarios. One is that major surgery will not be practical under shelter conditions. This requires highly trained personnel and the availability of expensive and sophisticated equipment A person with appendicitis would have a better chance with antibiotics and rest, taking nothing by mouth except medications and clear liquids, than with surgery by amateurs. (In the event of a nationwide disaster such as a nuclear war, our lack of protected hospitals like those that previously existed in Switzerland would cost lives that might be saved.)

Many items could be added to the list depending upon the level of training of the person in charge of the kit and the specific family situation. For example, persons who know what to do with them might want to store materials for splinting or casting fractures (which could be splinted by expedient means in the absence of such materials). Intravenous solutions (and the means of administering them) might also be stored. Because of expense, space requirements, and the need for some expertise in their use, they are not all listed here, but some examples of more advanced yet affordable options are given.

Approximate wholesale or retail prices (c. 2020), when available, are given in brackets. Many items can be acquired at a low price using a diligent internet search. Some smaller independent sellers may offer better deals than large outlets like Amazon or eBay.

MEDICAL CONTENTS OF THE MAIN EMERGENCY BAG

During a severe crisis there may be a situation requiring rushed evacuation. For such scenarios it is useful to have ready and even memorize the prioritized list of what should be packed first and what can be left behind, depending upon available time for evacuation and available means of transportation. It is good idea to always have prepared a main emergency bag containing:

- Most essential drugs and medical supplies
- Most essential documents common for the group
- Currency

- Tools of defense

Since such a bag will contain the critical items, it should be stored in a place that is easily accessible for the owner, but protected from being misplaced, stolen, or accessed by the strangers. In addition, each member of the group should have a small emergency ready bag containing personal medications, documents, and currency.

The medical items included in the emergency bag should be essential, as light as possible, and packed as compactly as possible. They are to be carried in an unexpected flight situation. ***There is no place here for frivolous ballast.*** The smaller the better. This could be commercially purchased first aid kit or simply separately purchased items placed into the light bag no larger than 8x5x2.5 zipper bag:

This is a list of the medical content of the emergency bag developed by Mercedes Benz: {$10-$20]

• Plastic adhesive strips • Extra-large adhesive strips • Sterile gauze pads • Stretch gauze • 2'' Roll gauze • 3'' Roll gauze • 2-3 Survival wrap silver emergency blanket • Latex free adhesive tape • First aid instructional booklet • Small Scissors • Isopropyl Alcohol pads • Hemostatic Pads (Fiber Cellulose)	

Essential Medications:

- Selected broad spectrum antibiotic(s) e.g.
  - Azithromycin (Zithromax) (see below)
  - Clindamycin (see below)
  - Doxycycline (see below)
- Painkillers
  - Non-narcotic
    - Oral:
      - Acetaminophen (Tylenol) (see below)
      - Ibuprofen (Advil) (optional—see below)
    - Topical:
      - 1 tube of diclofenac gel (see below)
  - Narcotic & other controlled dangerous substances—if prescribed to a member of the group. Members should have their CDS prescriptions in their own ER bags. In less severe crisis situations in which peacetime rules might still apply, carrying any CDS, especially without documentation, is a liability requiring careful consideration.
- GI medications
  - Loperamide (Imodium) tablets (not liquid—see below)

- Pepto-Bismol tablets (not liquid—see below)

LARGE STATIONARY KIT

The amount of medications, supplies, and equipment depends on size of the storage space in the shelter and budget available. As noted above, water and non-perishable food should have priority over the less essential medical supplies. It is also important to remember that most medical supplies must be periodically rotated since they have a limited shelf life.

DISINFECTANTS

Disinfectants are chemical agents designed to inactivate or destroy microorganisms on inert surfaces.

Isopropyl alcohol [$2 for 32 fl oz]: 70% is traditionally recommended. The optimum bactericidal concentration is 60%–90%; the cidal activity of all alcohols drops sharply when diluted below 50%.[1,2] It is a good disinfectant although it has limitations.[2] In addition, its fumes can be used to control nausea. Inhalation of isopropyl alcohol—from either skin prep alcohol swabs or from isopropyl alcohol-soaked sponge—has been found to have a moderate antiemetic action.[3–5] This method can provide temporarily relief while stronger antiemetics are being administered. Isopropyl alcohol is sold in groceries and pharmacies.

Virex Tb (by Diversey) [$70 for 12 bottles of 1 U.S. qt each] is a ready-to-use hospital-grade disinfectant, which provides excellent cleaning and deodorizing action. It acts as a powerful yet not noxious bactericide, tuberculocide, virucide, and fungicide. In addition, it is a great non-irritating mold control agent. Invasive mold grow can be a big problem in certain areas of the country.

Povidone iodine:

- **Betadine scrub** [$10 for 16 fl oz]: Use for cleansing intact skin only—the detergent is very irritating to open wounds and mucous membranes.
- **Betadine 10% solution** [$12 for 8 fl oz of 10% solution].
- **Diluted 0.35% betadine solution:** Traditionally in many hospitals, to create the dilute solution of betadine, the scrub nurse drew up 17.5 mL of 10% povidone-iodine with a syringe and mixed it with 500 mL of sterile isotonic sodium chloride solution. This resulted in a dilution of 0.35% povidone-iodine for use before wound closure. The effectiveness of this 0.35% solution to cleanse wounds has been found to be satisfactory.[6]
- Betadine is *not* suitable for water purification. (See below for the recommended water disinfection supplies)

Chlorine bleach (e.g., Clorox) (a 5.25% solution of sodium hypochlorite): This can be used to disinfect surfaces outside or to clean well-ventilated toilet areas. Chloride fumes are very noxious for most people and should not be used inside in poorly ventilated spaces.

Granular calcium hypochlorite [$14 for 1 lb] also known as dry pool chlorine (pool "burn out" or pool "shock treatment"): A solution of about the same concentration of hypochlorite as commercial bleach can be made by dissolving about 24.5 gm. (about 10 tablespoons) of the powder

in 1 gallon of water. CAUTION: The dry material gives off chlorine gas in small quantities, enough to cause symptoms in some persons. Also, the hypochlorite corrodes metal. Keep container tightly sealed, and prepare solutions in a well-ventilated area. Granular calcium hypochlorite can be used as:

- A general disinfectant instead of bleach (same precautions).
- For cleaning instruments and surfaces, a dilution of 1:10 is recommended. Such solutions are relatively unstable and should be freshly prepared. Scrub off the blood and body fluids (organic materials react with the chlorine and destroy it), then allow the instrument to soak in the disinfectant. *Note that tuberculosis organisms are uniquely resistant to chlorine.* Do not use hypochlorite for irrigating wounds (as was done during World War I), because it dissolves blood clots. For use as a water disinfectant, see below.

WATER DISINFECTION SUPPLIES

The safest way of disinfecting water is to boil it.[7] Bring water to a rolling boil for at least 1 (one) minute. At altitudes above 5,000 feet (1,000 meters), boil water for 3 (three) minutes. If water is cloudy, let it settle and filter it through a clean cloth, paper towel, or coffee filter. If boiling is impossible, you can use the following methods:

WATER PURIFYING CHEMICALS[7]

Household bleach:[7] Use only regular, unscented chlorine bleach products that are suitable for disinfection and sanitization as indicated on the label. The label may say that the active ingredient contains either 6% or 8.25% of sodium hypochlorite. Do not use scented, color safe, or bleaches with added cleaners. If water is cloudy, let it settle and filter it through a clean cloth, paper towel, or coffee filter. Locate a clean dropper from your medicine cabinet or emergency supply kit. Locate a fresh liquid chlorine bleach or liquid chlorine bleach that is stored at room temperatures for less than one year. Use the table below as a guide on how much bleach you should add to the water; for example, add 8 drops of 6 % bleach or 6 drops of 8.25% bleach to each gallon of water. ***Double the amount of bleach if the water is cloudy, colored, or very cold.*** Stir and let stand for 30 minutes. The water should have a slight chlorine odor. If it doesn't, repeat the dosage and let stand for another 15 minutes before use. If the chlorine taste is too strong, pour the water from one clean container to another and let it stand for a few hours before use.

Volume of Water	Amount of 6% Bleach to Add*	Amount of 8.25% Bleach to Add*
1 quart/liter	**2 drops**	**2 drops**
1 gallon	**8 drops**	**6 drops**
2 gallons	**16 drops (1/4 tsp)**	**12 drops (1/8 teaspoon)**

Volume of Water	Amount of 6% Bleach to Add*	Amount of 8.25% Bleach to Add*
4 gallons	**1/3 teaspoon**	**1/4 teaspoon**
8 gallons	**2/3 teaspoon**	**1/2 teaspoon**

*Bleach may contain 6 or 8.25% sodium hypochlorite.

Tincture of iodine: [$10 1 fl oz] This is usually 2% elemental iodine, along with potassium iodide or sodium iodide, dissolved in a mixture of ethanol and water. USP "Mild (2%) Tincture of Iodine" is defined as containing in each 100 mL, 1.8 to 2.2 grams of elemental iodine, and 2.1 to 2.6 grams of sodium iodide. Alcohol is 50 mL and the balance is purified water. To disinfect water, add 5 drops of 2% tincture of iodine to each quart or liter of water that you are disinfecting. If the water is cloudy or colored, add 10 drops of iodine. Stir and let the water stand for at least 30 minutes before use.[7]

Granular calcium hypochlorite (also see above): The first step is to make a chlorine solution that you will use to disinfect your water. For your safety, do it in a ventilated area and wear eye protection. Add one heaping teaspoon (approximately ¼ ounce) of high-test granular calcium hypochlorite (HTH) to two gallons of water and stir until the particles have dissolved. The mixture will produce a chlorine solution of approximately 500 milligrams per liter. To disinfect water, add one part of the chlorine solution to each 100 parts of water you are treating. This is about the same as adding 1 pint (16 ounces) of the chlorine solution to 12.5 gallons of water. If the chlorine taste is too strong, pour the water from one clean container to another and let it stand for a few hours before use. HTH is a very powerful oxidant. Follow the instructions on the label for safe handling and storage of this chemical. [7]

Commercial water disinfection tablets: You can disinfect water with tablets that contain chlorine, iodine, chlorine dioxide, or other disinfecting agents. These tablets are available online or at pharmacies and sporting goods stores. Follow the instructions on the product label as each product may have a different strength.[7] Examples of such tablets include:

- Potable Aqua ®
- Steramine Quaternary Sanitizing Tablet
- Aquatabs ®

PERSONAL WATER FILTERING DEVICES

During the recent decade numerous small portable personal water filtering devices have been developed for use by hikers and in military and survival situation. Manufacturers of those devices claim that those instruments are designed to remove nearly all waterborne bacteria and parasites (but not viruses) from drinking water. Those claims are not always well substantiated; a fair review of those devices can be found on the website: Nextluxury. Many of those instruments are quite expensive, and the filtration process while very efficient may not be as effective in

disinfecting water as boiling or chemical purification described above. In terms of simply filtering water (which must be subsequently boiled or purified) – much cheaper (but bulkier) filtration carafes available in grocery store seems to be a more frugal solution. However, such a portable personal filter may prove to be the only option available during situations that require living in the wilderness. A plethora of such portable field filters are sold. Here are few examples:

- MSR Guardian Purifier Pump [$350]
- Katadyn Pocket Filter [$370]
- Lifestraw Personal Filter
- Sawyer Products Mini Personal Filter
- Platypus Gravityworks Personal Filter
- Grayl Ultralight Filter Personal Filter

A NOTE ON COVID-19 RELATED DISINFECTANTS

In view of the COVID-19 pandemic CDC issued a set of recommendations regarding disinfection procedures related to SARS-CoV-2.[8] EPA compiled an extensive list of approved products for emerging viral pathogens.[9]

The ingredients used in many of those commercially produced disinfectants include:

- 1,2-Hexanediol
- Chlorine dioxide
- Quaternary ammonium
- Ethanol (ethyl alcohol)
- Hydrogen peroxide
- Phenolic

ANTISEPTICS

Antiseptics are chemical agents designed to inactivate or destroy microorganisms on living tissues.

Household vinegar (acetic acid, 5%): This can reduce the microbial count (especially *Pseudomonas*) in infected wounds. Half-strength vinegar can be used to irrigate the ear in external otitis. Use 3 Tbsp per quart of water as a douche for vaginal infections.

Chlorhexidine gluconate can be used as both disinfectant and antiseptic. There are studies suggesting that chlorhexidine is more effective than povidone iodine.[10] It is used for cleaning wounds, and in dentistry to prevent dental plaque and treating yeast infections of the mouth. It is available over the counter as topical chlorhexidine gluconate or dental chlorhexidine gluconate.

Hydrogen peroxide, 3% solution: Historically, hydrogen peroxide was used frequently for cleaning wounds. Its popularity was caused by the fact that it was proven to be bactericidal, it was less irritating than alcohol and other popular antiseptics, and it was much cheaper. Recently, it fell into disfavor since it is thought to inhibit healing and to induce scarring because it destroys newly formed skin cells.[11] Moreover, due to concern about air embolism hydrogen peroxide use has decreased in surgery.[12] Still, 2020 Lexicomp lists following indications for its use: antiseptic for minor dermal abrasion, removal of oral secretions, irritation of mouth, gum, raised seborrheic

keratoses. Its use as a disinfectant during COVID-19 pandemic caused periodic shortages of this chemical.

MOLD AND MOISTURE CONTROL SUPPLIES

Invasive mold growth and moisture formation due to high humidity is a big problem in certain areas of the country. This may be an especially difficult problem for underground shelters, which tend to be damp. Mold can damage fabric, food, and medical supplies such as bandages, etc. Exposure to mold has been proven to cause many negative health consequences.[13] Condensation of moisture in containers and in storage spaces especially in underground shelters can cause damage to equipment, corrosion of food cans, etc. Therefore, while mold and moisture control is not per se a medical issue, it is certainly health related and the basic mold/moisture prevention supplies will be discussed here briefly. The best way to control moisture and mold during peace time is use of electric dehumidifiers. However, this strategy may be difficult during a crisis. The utilization of passive desiccants such as silica gel packs would be a better option in circumstances of electricity shortages.

Silica gel desiccant rechargeable packs: A wide variety of silica gel desiccants is available. They range from the cheapest paper packs to the transparent plastic-wrapped granules that change color when maximal absorption of humidity is reached. Such packs should be placed liberally in the containers in which drugs, equipment, and medical supplies are stored. Their effectiveness can be monitored using humidity indicator cards. Naturally, silica gel packs must be changed. Used packs can be recharged in a microwave or conventional oven according to manufacturer's instructions.

Virex Tb (by Diversey): see above.

Chloride is recommended as a good and cheap mold control agent, but its usefulness in the shelter is dubious. Chloride fumes are extremely noxious, and chloride can cause corrosion of metal parts.

DRESSINGS

- Band-Aids (also useful in construction of a Kearny fallout meter (2 boxes)
- Sanitary napkins to use as pressure dressings
- Gauze pads (4 by 4 inches, 4 packs of 200 each)
- Conforming gauze roller bandage (4") (12)
- Tape (1 inch, 12 rolls)
- Elastic bandages e.g., Ace brand (4 inch) (2)
- Safety pins (box of assorted)
- Bedsheet for making triangular bandages, strips as required
- Sewing shears
- Regenerated etherized and oxidized natural fiber cellulose hemostatic pads for skin abrasion and nose bleeds, e.g.
    - CVS Advanced Blood Stop®
    - BleedCease®

BASIC SURGICAL INSTRUMENTS (FOR MINOR WOUND REPAIRS)

- Iris scissors (1 curved, 1 straight)
- Mayo type scissors (one sharp, one rounded blade)
- Needle holder
- Hemostat (Kelly clamp) (2)
- Splinter forceps.
- Tissue forceps with teeth
- Scalpel handle (#3)
- Scalpel blades: (10 each, #10, 11, 15)
- Suture needles, assorted (1 dozen 0000 nylon)
- Reusable needles obtained from veterinary supplier
- Suture material (catgut from veterinary supplier; cotton and nylon thread)

MORE ADVANCED SURGICAL REPAIRS

- PPE: Sterile gloves, surgical mask, eye protection
- Local Anesthesia:
    - Buffered lidocaine with epinephrine (or without) 1 percent or similar local anesthetic—but do NOT use epinephrine on digits
    - Small volume syringe (e.g., 3 or 6 mL) with small gauge needle (e.g., 27 or 30 gauge) for infiltration of local anesthetic
- **Suture materials:**
    - Absorbable suture will resorb within 60 days. Commonly used subcutaneous absorbable sutures are polyglactin 910 (Vicryl®), poliglecaprone 25 (Monocryl®), and polyglycolic acid (Dexon®). Chromic gut is appropriate for surface sutures on mucosa. Fast-absorbing gut and, for scalp lacerations, coated polyglactin 910 [Vicryl Rapide®] are appropriate for skin sutures.
    - Nonabsorbable suture will not resorb within 60 days. Nylon (Dermalon®, Ethilon®), Polybutester (Novafil®), and polypropylene (Surgilene®, Prolene®) are commonly used.
- Surgical probe
- Sterile 4 x 4 gauze
- Absorbent towels
- Sterile field drapes
- Stapler, dermal adhesive (for hair apposition technique), or sutures

Emergency departments generally are well equipped with commercially produced pre-packed minor surgical trays ("laceration trays") that contain the instruments, sterile gauze, towels, and drapes listed above. Various versions of such trays may be purchases without prescription from online outlets such as Amazon, e.g.: Medline DYNDL1024SF Standard Laceration Tray

DIAGNOSTIC EQUIPMENT

Basic:

- Thermometers (preferred: non-battery operated Galinstan (mercury-free) glass thermometers) [$14]
- Sphygmomanometer (preferred: manual not battery operated) [$19]

- Stethoscope (nurse's) [$24]
- Pen flashlight (one can use any flashlight or even a cellphone camara flash lamp as long as cellphones are operational)
- Extra batteries (rechargeable batteries may prove to be superior if one has an electric generator)

Advanced:

- Pulse oximeters: (In the view of COVID pandemic this would be a good investment.) Affordable [<$25] simple fingertips pulse oximeters are widely available
- Continuous recording pulse oximeters [$60]
- Glucometer with testing tips: A wide variety of very cheap glucometers are available. While naturally they are must for patients diagnosed with diabetes, it is good idea to have a shelter equipped with a glucometer, since it can provide valuable information for trained medical personnel during evaluation of previously healthy person.
- HbA1C meter: Affordable HbA1c home tests kits [$50] became available. They can be useful naturally for diabetic patients but for trained personnel during evaluation of previously healthy individual.
- Oxygen tank
- Oxygen concentrator: A variety of consumer-grade oxygen concentrators, which can be purchased without prescription, are now available from online merchants .
- Apple watch 6 which contains a simple ECG and pulse oximeter

OTHER CLINICAL SUPPLIES AND EQUIPMENT

- Latex gloves (box of 100) [$18]
- Syringes (1 box of disposable 3-5 cc syringes and/or several of reusable glass; several 1 cc syringes for administering adrenalin)
- Assorted needles (21, 25 gauge)
- KY jelly (2 tubes)
- Cotton-tipped applicators
- Baby ear syringe (a rubber bulb useful for suctioning mouth of newborn or for irrigating ears)
- Umbilical clamps (strips of clean cloth can substitute)
- Plastic oral airways of assorted sizes: This simple device can keep an unconscious patient from "swallowing his tongue."
- Foley catheter set [kit that includes catheter and drainage bag]
- Enema bag
- Notebook, pencils, pens
- Soap
- Measuring spoons
- Dropper bottles
- Plastic bags

NOTE ON FACIAL MASKS AND RESPIRATORS:

In view of the COVID pandemic there is a lot of controversy as well as contradictory opinions about benefits and risks of using various types of face masks to prevent coronavirus. Some authors claim that all face masks are useless and even detrimental.

This is a brief review of available facial masks and respirators :

- **Fabric masks** (fashion/urban reusable fabric masks): They are currently (January 2021) being recommended as an obligatory COVID prevention measure by most authorities.
- **Plain surgical face masks**: In the past it was agreed that those provided limited if any protection against coronavirus or any other virus. The initial opinion was that those masks are not designed to protect their wearers. They are used primarily to protect OTHERS from the droplets of secretions of the person who wears the mask. But this opinion is evolving.
- **N-95 masks:** This name is mentioned frequently in the media and confuses laypeople. N-95 is a designation in a rating system developed by the National Institute for Occupational Safety and Health (NIOSH). "N" means that mask will be NOT be resistant to petroleum (unlike mask designated as "P," which will be). The number 95 means that mask is certified to block 95% of particles equal or larger than 0.3 micrometers. Coronaviruses are on average about 0.1 micrometers in size. Therefore, they may theoretically go through N-95 masks. However, viruses typically survive in droplets of fluid (e.g., sputum), which are larger than 0.3 micrometers. N-95 masks will block those. Therefore, CDC recommends use of N-95 masks to prevent viral infection including coronavirus. Unlike plain surgical masks, N-95 masks are difficult to breathe through, and their effectiveness also depends on a very good fit, which is unlikely to be obtained by untrained consumers. Hospital programs perform formal fit tests for masks for the staff on yearly basis. If the masks have an unfiltered exhaust valve to facilitate breathing, they protect the wearer only.
- **SAMGO1® RS1 particle mask:** [$5.50] This mask removes particles down to 0.027 microns. It has an enclosed filter for both inhaled and exhaled air.
- **ReadiMask® by Sabre:** [$12] This adhesive-sealing face and eye shield is designed for military and law enforcement personnel. It also protects against tear gas. It is one-time-use only and cannot be used by men with facial hair.
- **Powered air purifying respirator (PAPR) with HEPA filters:** Those devices use a motor-operated fan to blow air through the filtering cartridge to the user. They are easier to breathe through, but they require a battery to work. PAPR are used by infectious disease medical personnel who take care of the highly infectious patients. Their use requires training, and those devices can be quite expensive ($1,000). They would provide the optimal protection against coronavirus when properly used.
- **Gas masks:** Military grade gas masks with cartridges certified against biological viral warfare will protect efficiently against coronavirus. One must remember that gas masks are effective only if used with the correct cartridge/filter for a particular biological or chemical substance. There are cartridges available that protect against more than one hazard, but there is no "all-in-one" filter that protects against all substances.

It is important to understand that use of facial mask/respirators is only one part of quite complicated infection prevention methodology. Ideal prevention of viral infection requires use of barrier methods such as disposable gowns or biohazard suits, goggles, hoods, gloves, and special

decontamination procedures. It is unlikely that lay people can apply all those correctly or that those methods are even practical or affordable for the average person. Even the best trained medical military personnel occasionally get infected despite use of the strictest infectious disease prevention methodology.

Recommended minimal solution for the shelter:

- Surgical masks (box of 50) [prices vary]: A mask helps protect against airborne infections and would be of some benefit in preventing inhalation of small particles if one needed to go out of doors in fallout conditions.
- N-95 Masks (box of 20): See discussion above.

OVER THE COUNTER (OTC) MEDICATIONS

There is a variety of popular OTC meds. Many of them are premixed combinations of various drugs (e.g., Dayquil,® NyQuil,® etc.) prepared for the convenience of customers. Those are fine, but in a crisis condition it is better to have stored a single pure version of OTC drugs. People may be allergic or have other contraindication to one or more components of the premixed preparations.

- **Acetaminophen** (Tylenol®) 500-mg "extra strength" (1000 tablets)
- **Acetaminophen liquid** for children (1 bottle)
- **Antacids**
    - Omeprazole (Nexium®), a proton-pump inhibitor
    - Famotidine (Pepcid®)
- **Antihistamines**
    - Non-Sedating (relatively
        - Fexofenadine (Allegra®)
        - Loratadine (Claritin®)
    - Sedating
        - Diphenhydramine (Benadryl®) 25 mg (1000 tablets) Benadryl is also useful for hives, and of some value for nausea.
- Aspirin 300 mg or 10 gr (1000 tablets)
- **Kaopectate®:** The active ingredient in Kaopectate has changed since its original creation. Originally, **kaolinite** was used as the adsorbent and pectin as the emollient. **Attapulgite** (a type of absorbent clay) replaced the kaolinite in the 1980s but **was banned by the U.S. Food and Drug Administration** in a ruling made in April 2003. As a consequence, **since 2004, bismuth subsalicylate has been used as the active ingredient in U.S.-marketed products**. In Canada, McNeil Consumer Healthcare continues to market Kaopectate using attapulgite as the active ingredient.
- **Bismuth subsalicylate** (Pepto-Bismol®): This time-honored GI medication is weak but moderately effective against diarrhea, nausea, and heartburn. Close attention must be paid to the concentration when administering to children. Children and adolescents who have or are recovering from chicken pox or flu-like symptoms should not use bismuth subsalicylate due to the association with Reye syndrome.

- **Petrolatum** (vaseline, 1 lb) [$10]: This lubricant and emollient is especially good for diaper rash or for making nonadherent dressings.
- **Phenylephrine** replaced pseudoephedrine as common decongestant. Use: 10 mg every 4 hours as needed for ≤7 days (maximum: 60 mg/24 hours). Pseudoephedrine is subject to increasingly strict regulations because of concern that it might be used as a substrate for crystal meth production.
- **Tolnaftate powder** (Tinactin,® 45 gm) [$2.10]: Apply bid-tid for fungal skin infections.
- **Zinc oxide** (1 lb) [$16]: This mild astringent and antiseptic is used in diaper rash and various skin diseases, or as a sunscreen.
- **Laxatives**: The safest are bulk forming. Phosphate-containing laxatives are not recommended any more. Mineral oil (enema and oral liquid) laxatives are not generally recommended except as enema following disimpaction. Refer to the table below for all options:

Medication	Usual adult dose	Onset of action	Side effects
Bulk-forming laxatives*			
Psyllium	Up to 1 tablespoon (≅3.5 grams fiber) 3 times per day	12–72 h	Impaction above strictures, fluid overload, gas and bloating
Methylcellulose	Up to 1 tablespoon (≅2 grams fiber) or 4 caplets (500 mg fiber per caplet) 3 times per day	12–72 h	
Polycarbophil	2 to 4 tabs (500 mg fiber per tab) per day	24–48 h	
Wheat dextrin¶	1 to 3 caplets (1 gram fiber per caplet) or 2 teaspoonfuls (1.5 gram fiber per teaspoon) up to 3 times per daily	24–48 h	
Surfactants (softeners)			
Docusate sodium	100 mg 2 times per day	24–72 h	Well tolerated. Use lower dose if administered with another laxative. Contact dermatitis reported.
Docusate calcium	240 mg 1 time per day	24–72 h	
Osmotic agents			
Polyethylene glycol (macrogol)	8.5 to 34 grams in 240 mL (8 ounces) liquids	1–4 days	Nausea, bloating, cramping
Lactulose	10 to 20 grams (15 to 30 mL) every other day. May increase up to 2 times per day.	24–48 h	Abdominal bloating, flatulence

Sorbitol	30 grams (120 mL of 25 percent solution) 1 time per day	24–48 h	Abdominal bloating, flatulence
Glycerin (glycerol)	One suppository (2 or 3 grams) per rectum for 15 minutes 1 time per day	15–60 minutes	Rectal irritation
Magnesium sulfate	2 to 4 level teaspoons (approximately 10 to 20 grams) of granules dissolved in 8 ounces (240 mL) of water; may repeat in 4 hours. Do not exceed 2 doses per day.	0.5–3 h	Watery stools and urgency; caution in renal insufficiency (magnesium toxicity)
Magnesium citrate	200 mL (11.6 grams) 1 time per day	0.5–3 h	
Stimulant laxatives			
Bisacodyl	10 to 30 mg as enteric coated tabs 1 time per day	6–10 h	Gastric irritation
	10 mg suppository per rectum 1 time per day	15–60 minutes	Rectal irritation
Senna	2 to 4 tabs (8.6 mg sennosides per tab) or 1 to 2 tabs (15 mg sennosides per tab) as a single daily dose or divided twice daily	6–12 h	Melanosis coli
Other			
Lubiprostone	24 micrograms 2 times per day	24–48 h	Nausea, diarrhea
Linaclotide	145 micrograms 1 time per day	12–24 h	Diarrhea, bloating
Plecanatide	3 mg 1 time per day	12–24 h	Diarrhea

FROM THE GROCERY STORE

Baking soda is used for preparation of homemade oral rehydration solution—see below. It has been used as an antacid, though it is certainly not ideal. Persons who need to restrict sodium intake should not take soda for an upset stomach.

Coca-Cola syrup: Concentrated cola syrup was frequently used in the past as a home anti-emetic remedy. It was cheap and widely available in grocery stores. With time it has disappeared from grocery stores. However, it is still available as "Flents Cola Syrup" found on Amazon or from pharmacies like Walgreens. There is plenty anecdotal evidence about its effectiveness, and this is a relatively safe simple remedy. There are also anecdotal reports about parents using Mexican (real sugar containing Coca-Cola) as a pediatric ad-hoc anti-emetic: they let this drink sit open until it goes flat. Mexican cola is affordable compared to "organic colas." Note that many

"organic" colas do not contain preservatives; while this is a healthy approach, it shortens shelf life to few months.

Ginger Tea or REAL GINGER ALE (NOT GINGER BEER or cheap "Ginger Ale" like Canada Dry): Ginger (*Zingiber officinale*) has been long recognized as an herbal remedy for various GI symptoms including nausea, vomiting, and diarrhea. This activity is attributed to ginger's pungent principles such as gingerols and shogaols. There were few preclinical and clinical studies, which have shown that is an effective and safe treatment for nausea and vomiting.[15]

Traditionally many hospitals typically stock various type of ginger ales, as a preferred drink for sick patients. Ginger ale is also still used by many parents as a simple and mild GI remedy for their children. Unfortunately, it appears that most commonly available ginger ale sodas such as Canada Dry do not contain enough ginger to act effectively.[16] Those sodas also contain high-fructose corn syrup, which is not the most desirable nutrient.[17] Some premium (hence expensive) ginger ales like Fever Tree brand contain an ample amount of ginger. Therefore, in general using ginger herbal teas appears to be a better and cheaper solution than reliance on ginger ale. However, if one can afford it—having a stash of Fever Tree ginger ale would be a better choice for drinks than having "diet colas" and similar unhealthy soft drinks. Fever Tree ginger ale has a shelf life about 2 years—longer than many sodas without preservatives. Still the best rehydration fluid for emergencies should be potassium-containing water (see below).

Pedialyte®: this is an expensive but recently popular form of fluid replacement used even in adults (under the brand name "Sparkling Rush")

Bottled Water

- Having an ample supply of clean water is a top priority in an emergency.
- Store at least 1 (one) gallon per person, per day. Consider storing at least a two-week supply of water for each member of your family. If you are unable to store this quantity, store as much as you can.
- It is recommended that you purchase commercially bottled water rather than use collected tap water as an emergency water source. Keep bottled water in its original container, and do not open it until you need to use it.
- A normally active person needs to drink at least two quarts (half gallon) of water each day.
- People in hot environments, children, nursing mothers, and ill people will require even more.
- Remember: in addition to drinking it, you will also need water for food preparation and hygiene and medical use.

POTASSIUM IODIDE (discussed above)

To block the thyroid gland to prevent uptake of radioactive iodine contaminating food and water, take 4 drops of a saturated solution daily. (Fill a brown dropper bottle about 60% full with crystals, then add water until bottle is 90% full. Shake. Check to be sure that some crystals remain out of solution. See *Nuclear War Survival Skills*, p. 114.)

Potassium iodide has been used for many indications in medicine, even tuberculosis, now long forgotten. Will there be a revival, if antibiotics lose effectiveness or become unavailable? It is possible at present to buy crystalline KI by the kilogram [about $130].

PRESCRIPTION DRUGS

The following is not intended as a self-treatment guide, but as a guide to choosing drugs for storage. Always seek medical advice before using these potent drugs, all of which have potentially serious side effects, including death. Antibiotics should not be used when they are ineffective and unnecessary because of side effects and the risk of selecting out resistant bacteria.

For guidance in determining quantities, the usual duration of treatment for an episode of illness is about 10 days. Adult dosages are given unless otherwise indicated. Abbreviations: bid=twice a day; tid=three times daily; qid=four times daily.

Do not take outdated tetracycline, as kidney damage may result.

Always ask the patient whether he is allergic to the drug. If he has a history of hives (an itchy skin rash) or wheezing or swelling in the mouth or throat, do not give the medication, as a fatal reaction may occur.

Antimicrobials

Penicillin V 500 mg (1000 tablets): Give 500 mg qid for streptococcal or pneumococcal infections, or anaerobic infections "above the diaphragm" such as abscessed teeth. Although its spectrum is limited, this drug is relatively cheap and causes fewer side effects such as diarrhea and vaginitis. Unfortunately, Streptococci and Pneumococci are increasingly resistant.

Amoxicillin 250 mg (500 capsules): Give 250 to 500 mg id for urinary, middle ear, and lower respiratory infection. This is a broader spectrum penicillin. Staphylococci are usually resistant.

Ampicillin or amoxicillin oral suspension 250 mg/tsp (60 doses): The suspension is for children who cannot swallow amoxicillin capsules. Give 1/2 to 1 tsp qid, depending on the size of the child.

Erythromycin ethylsuccinate 400 mg (500 tablets): Give two tablets bid for pneumonia or streptococcal sore throat. The drug is also of some benefit in staphylococcal skin infections.

Azithromycin (Z-Pak®): This macrolide is used more often than erythromycin and is better tolerated by many people. It may substitute for penicillin in allergic patients. Azithromycin is also used to treat *Helicobacter pylori* infection, travelers' diarrhea and other gastrointestinal infections, Legionnaires' disease, pertussis (whooping cough), babesiosis (a tick-borne disease), and atypical mycobacteria. The effectiveness of azithromycin in treatment of COVID-19 (usually in combination with hydroxychloroquine and zinc) is being evaluated in ongoing clinical trials.

Tetracycline 250 mg (1000 capsules): Give 250-500 mg qid for plague and various other insect-born infections; urinary infections; bronchitis; infected animal bites; some venereal diseases; Rocky Mountain spotted fever. Avoid this class of drug in pregnant women and young children, if possible.

A more expensive drug in this class is doxycycline 100 mg, which is given once daily (twice for severe infections). Doxycycline has fewer gastrointestinal side effects and is better absorbed than tetracycline with food in the stomach, but is more likely to sensitize the skin to sunlight.

Oxytetracycline is used for intramuscular injection (250 cc, 200 mg/cc). [It might be available from veterinary suppliers.] The dose is about 500 mg bid for severe, life-threatening

infections, or 100 mg tid for mild infections, in which case oral treatment is probably preferable. The injectable form may be necessary in patients too ill to take oral medications or for illnesses like plague or anthrax, which may be fatal before oral medication is absorbed. Intramuscular injection is painful; a local anesthetic may be given simultaneously.

Metronidazole (Flagyl®) 250 mg (500 tablets): The usual dose is 500 mg tid, higher for some infections (e.g., amebiasis). The drug is effective against certain protozoans including amoebae and Giardia, and for anaerobic bacteria such as those that normally inhabit the bowel and the female genital tract. It can be extremely useful in intraabdominal, pelvic, and wound infections caused by such bacteria.

Chloramphenicol: The dose is 500 gm qid for anaerobic infections; typhoid and other Salmonella infections; psittacosis; rickettsial infections; or meningitis due to Hemophilus or Meningococcus. This drug is very well absorbed from the gastrointestinal tract and penetrates well into the cerebrospinal fluid (hence its value in meningitis). However, it causes fatal aplastic anemia in about 1 in 50,000 persons treated with it, and some drug companies have stopped manufacturing it.

Trimethoprim-sulfamethoxazole DS (Bactrim®, Septra®) (500 tablets): Give one double strength (DS) tablet bid for urinary infections and some types of bacterial diarrhea, or as a back-up drug for sinusitis, bronchitis, ear infections (for resistant organisms or allergic patients).

Others: Some excellent broader-spectrum drugs, especially ampicillin with clavulanic acid (Augmentin®), cefuroxime (Ceftin®), and ciprofloxacin (Cipro®, also useful for anthrax) are not included, solely because of expense.

Clindamycin (Cleocin®) (150 mg): This broad-spectrum antibiotic is also effective against anaerobes and is used to treat dental abscesses. Off-label uses include anthrax and malaria.

Hydroxychloroquine (200 mg, 1,000 tablets): Listed as an essential drug by the World Health Organization, it has been widely used for malaria prophylaxis and treatment; the malaria parasite has, however, become resistant in many parts of the world. In 2020, it came to prominence as a proposed prophylactic and early treatment for coronavirus. It also treats amoebic liver abscess, Q fever, babesiosis, and various rheumatic conditions.

Ivermectin (3 mg in U.S.): Also designated by WHO as an essential drug, ivermectin is effective against many parasitic diseases. In the U.S., it has been primarily used for scabies and head lice. If sanitation breaks down, other parasites could invade new regions. It is being widely used for coronavirus in many areas. You might also want to stockpile this drug for your dog, your horse, and your livestock. FDA warns against human use of veterinary preparations. Dosage is by weight, and varies by species. Some veterinary preparations contain other dewormers such as clorsulan or closantel, which is poisonous to humans. Always read the manufacturer medication guide for the ingredients of the preparation and cross check with reliable internet sources concerning human toxicity of any non-human use medication. The potential use of ivermectin for dengue is being explored.

Testing Antibiotics for Age Degradation

As of 2020, WHO still uses *Basic Tests for Pharmaceutical Substances* (1986) and *Basic Tests for Pharmaceutical Dosage Forms* (1991).

For Allergic Reactions and Asthma

Adrenalin (epinephrine) for injection (1 cc glass ampoules). If an auto-injector is not available, give 0.1 to 0.5 cc of a 1:1000 solution intramuscularly for acute anaphylaxis from a drug or other allergy such as bee sting, or for a severe asthma attack.

Prednisone 5 mg (1000 tablets): The dosage is variable, usually starting with 40 to 60 mg, tapering as rapidly as possible. Prednisone is used for *severe* cases of asthma, poison ivy, sunburn, and allergic reactions, but is not a substitute for epinephrine because the response is not sufficiently rapid. Use with great caution because steroids depress the immune response, among other side effects; however, the drug can be life-saving. Note that blood sugar may be seriously out of control in diabetics.

Theophylline, once a mainstay of treatment for asthma and chronic obstructive lung disease (COPD), is much less used today. Tea contains a little theophylline.

Metaproterenol inhaler (Alupent® or other beta-adrenergic blockers) acutely relieves bronchospasm and wheezing.

For Nausea and Vomiting

Ondansetron (Zofran®): 4 mg every 8 to 12 hours as needed

Prochlorperazine (Compazine®) 25 mg (100 tablets): Often used for nausea and vomiting, this drug also may be of some value in acute psychosis. One consultant recommended promethazine (Phenergan®) 50 mg instead . Phenergan does not have the additional indication for therapy of psychotic disorders.

For Psychologic Distress

Phenobarbital 60 mg (300 tablets). A dose of 30-60 mg is useful as a sedative. The usual anticonvulsant dose is 90 mg daily. CAUTION: Barbiturate addiction is very dangerous; fatal withdrawal reactions have occurred.

Haloperidol (Haldol®) (15 cc vial, 2 mg/cc): Start with 1 mg intramuscularly for otherwise unmanageable acute psychotic reactions. *Monitor the blood pressure.*

For Pain

Lidocaine (Xylocaine®) 1 or 2% (two 50-cc vials): For local anesthesia.

Tramadol (Ultram®), once preferred because it was supposedly less addicting and thus unscheduled by the Drug Enforcement Administration (DEA), became a Schedule IV controlled substance in 2014 and might become more severely regulated in the future. With the "war" on drug overdoses, obtaining, using, and storing controlled substances is increasingly problematic.

Codeine: Codeine is both cheaper and more effective for pain relief in combination with acetaminophen (or aspirin). It also relieves severe cough. Acetaminophen with codeine 60 mg (equivalent to Tylenol #4) is a Schedule III narcotic.

Proparacaine ophthalmic solution 0.5% (2cc): Use 1 to 2 drops to anesthetize the cornea of a patient with a foreign body in his eye. *Use only once to enable you to remove the foreign body. Continued use may allow severe damage to the eye to occur without the patient's awareness.*

Ketorolac (Toradol®) is a nonsteroidal anti-inflammatory drug (NSAID) available as an oral or injectable preparation. It has many side effects such as GI bleeding, but is easier to obtain and use because it is not a DEA-controlled substance.

For Heart and Blood Pressure

Hydrochlorothiazide 50 mg (1000 tablets): This diuretic drug helps to control high blood pressure or congestive heart failure.

Nitroglycerin: This is administered under the tongue to relieve acute angina (heart pain).

Digoxin (Lanoxin®) 0.25 mg (100 tablets): This is used for certain cardiac conditions such as congestive heart failure or atrial fibrillation with rapid heart rate. The usual maintenance dose is one tablet per day or 1/2 tablet in the elderly. It has been largely replaced by newer, far more expensive medications. Dosage must be carefully monitored because of toxic effects on the heart, especially if the patient has low potassium levels or impaired kidney function.

Atropine 0.5 mg/cc (30 cc): Because it speeds the heart rate, this drug is useful in some heart attack victims if they have a profound decrease in pulse. More importantly, it is an antidote to many poisons (such as organophosphate insecticides, some poisonous mushrooms, and chemical warfare agents such as tabun and sarin).

Miscellaneous

Keep a year's supply of any prescription drug needed by a family member. Rotate each year. Rotation is especially important for drugs with a short shelf life, such as insulin. (Insulin lasts about six months at room temperature, but for only two to six weeks at 80 degrees F.) Health plans generally pay only for just-in-time renewals. This could be disastrous in the event of any interruption in the supply chain—which for most drugs starts in China.

Immunizations, especially tetanus, should be kept current. (Tetanus toxoid should be given every ten years. For dirty wounds, a booster may be given if the last dose was more than five years prior to the injury.)

ORAL FLUID REPLACEMENT

Burns

Add a slightly rounded teaspoon of salt to one qt of water (the equivalent of half-normal, i.e., 0.45%, saline). Have victim drink 4 to 8 quarts in first 8 hours (sipping slowly), 4 to 8 qt in the next 16 hours, then as dictated by thirst.

Cholera or other severe diarrheal illness

Homemade oral rehydration solution (ORS):To one qt of water add a scant tsp Lite-Salt or other salt substitute (a mixture of sodium and potassium chloride), 10 tsp sugar, and 1/3 tsp sodium bicarbonate. This is far less expensive than Pedialyte. The Russians use activated charcoal to absorb toxins.

DENTAL CARE MEDICATIONS AND SUPPLIES DURING CRISIS

Dental problems such as tooth infections are frequently overlooked by preppers. Those emergencies while harrowing do not happen frequently. In peace time they typically are not immediately life-threatening. However, during disasters dental abscess can cause immobilizing pain, can interfere with survival activities, and lead to life- threatening complications. Those events represent a major problem in the survival situation. Antibiotic and pain therapy can be tried first and if ineffective a dental extraction may need to be performed.

While every effort should be made to have access to a trained dentist even during a major upheaval, this may not be possible. In such cases having a simple tooth kit extraction may prove to be useful. Certainly, a tooth can be removed with any clamp-like tool in desperate circumstances but having a professional set just adds safety and comfort. Inexpensive professional tooth extraction kits may be purchased from mainstream Internet outlets such as Amazon without prescription.

Uncomplicated tooth extraction in otherwise healthy patient is simple. There are short YouTube videos illustrating the process, usually from developing countries Complicated extraction can, however, be a harrowing process, and the inability to stop the bleeding after it may constitute a major problem.

Basic Dental tools:

- Basic dental extraction forceps & elevators set

Dental Meds:

- Antibiotics for treatment of dental abscess
  - Clindamycin
  - Ampicillin and sulbactam (Unasyn®)
- Pain management
  - Acetaminophen + ibuprofen combination

USEFUL BOOKS & OTHER INFO RESOURCES

Printed Materials

Many of these will be available only in second-hand outlets.

Cain, Harvey, ed. *Emergency Treatment and Management,* 7th ed, WB Saunders, 1985 (indispensable).
Emergency War Surgery (First US revision of *The Emergency War Surgery NATO Handbook),* Desert Publications, Comville, AZ 86325.
Kearny, Cresson. *Nuclear War Survival Skills* (indispensable).
Lindsey, Douglas. *Simple Surgical Emergencies*. Arco Publishing, New York, 1983 (simple wisdom from the ER front lines).
Physician's Desk Reference. This is a compendium of package inserts from various drugs. It is not the best book for learning about drugs, but doctors previously got a free copy every year, courtesy of pharmaceutical companies. Your doctor might be willing to give you an old one. These days, doctors generally rely on the internet, but what if the power is off and the internet is down?
Sanford, Jay P. *Guide to Antimicrobial Therapy 1988.* Order recent edition from www.sanfordguide.com.
Werner, David. *Where There Is No Doctor: A Village Health Care Handbook.* The Hesperian Foundation. (The basics—including how to give an injection, how to treat some dislocations and fractures, the use of common drugs, and assisting at a normal delivery).
Wilkerson, James A. *Medicine for Mountaineering.* The Mountaineers, Seattle, Washington, 1985.
A Merck Manual and/or a copy of *Current Therapy* (the latter comes out every year so check the used bookstore).
A textbook of medicine, such as *Harrison's Principles of Internal Medicine* or Beeson-McDermott *Textbook of Medicine,* a textbook of obstetrics, such as *Williams Obstetrics,* and a pediatrics textbook are also helpful. (Again, check the used bookstore.)

Electronic Media
Crisis Dentistry: How to Give Dental Help When There Is No Dentist by Mark Thoreson DDS

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