Capsules are solid dosage forms in which the drug is enclosed within either a hard or soft soluble container or ‘shell.’ The shells are usually formed from gelatin; however, they also may be made from starch or other suitable substances.

Uses

- Hard shell capsules offer a customized dosage form that can be made easily and conveniently in the pharmacy.
- Almost any dose desired for a variety of administration routes (oral, rectal, vaginal) can be made quickly and cheaply.
- Because the quantity of drug formulated into capsules can be measured accurately, this system is especially ideal for potent drugs and chemicals.
- Combining several ingredients into a single dosage form can reduce the number of products a person has to take and improve compliance.
- Capsules can mask unpleasant taste, aroma or appearance of a drug.
Capsule Components

1. **Active Ingredients**
   - Bulk powders (may have to aliquot)
   - Manufactured solid dosage forms (tablets or capsules)
   - Compatibility Issues
     - Efflorescent Powders
     - Deliquescent Powders
     - Light, Easily Aerosolized Powders

2. **Excipients**
   - Bulk powders (lactose, starch, Ca carbonate, Kaolin, etc.)

3. **Hard or soft soluble container or shell**
Capsule Types

- Soft-shell

- Hard-shell
  - Gelatin and 10-15% water
  - Require “tight storage” and adequate relative humidity
    - low humidity – capsules become brittle
  - Clear and assorted colors
  - “Cap” and “Body”
Capsule Sizes

- **Sizes**
  - 000 (largest) > 00 > 0 > 1 > 2 > 3 > 4 > 5

- **Advantages and Disadvantages**
  - Smallest capsule size (5)
    - easy to swallow
    - difficult to handle
    - little margin for weighing error
  - Large capsule size (00)
    - difficult to swallow
    - easier to handle
    - more margin for weighing error
# Approximate Capacities of Gelatin Capsules for Representative Drugs and Chemicals

<table>
<thead>
<tr>
<th>Capsule Size</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>00</th>
<th>000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. Volume (mL)</td>
<td>0.13</td>
<td>0.20</td>
<td>0.27</td>
<td>0.37</td>
<td>0.48</td>
<td>0.67</td>
<td>0.95</td>
<td>1.36</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug Substance</th>
<th>Capacity in grams of drug powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>0.13 0.18 0.24 0.31 0.42 0.54 0.75 1.10</td>
</tr>
<tr>
<td>Aluminum hydroxide</td>
<td>0.18 0.27 0.36 0.47 0.64 0.82 1.14 1.71</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>0.13 0.22 0.31 0.40 0.53 0.70 0.98 1.42</td>
</tr>
<tr>
<td>Aspirin</td>
<td>0.10 0.15 0.20 0.25 0.33 0.55 0.65 1.10</td>
</tr>
<tr>
<td>Bismuth subnitrate</td>
<td>0.12 0.25 0.40 0.55 0.65 0.80 1.20 1.75</td>
</tr>
<tr>
<td>Calcium carbonate</td>
<td>0.12 0.20 0.28 0.35 0.46 0.60 0.79 1.14</td>
</tr>
<tr>
<td>Calcium lactate</td>
<td>0.11 0.16 0.21 0.26 0.33 0.46 0.57 0.80</td>
</tr>
<tr>
<td>Corn starch</td>
<td>0.13 0.20 0.27 0.34 0.44 0.58 0.80 1.15</td>
</tr>
<tr>
<td>Lactose</td>
<td>0.14 0.21 0.28 0.35 0.46 0.60 0.85 1.25</td>
</tr>
<tr>
<td>Quinine sulfate</td>
<td>0.07 0.10 0.12 0.20 0.23 0.33 0.40 0.65</td>
</tr>
<tr>
<td>Sodium bicarbonate</td>
<td>0.13 0.26 0.32 0.39 0.52 0.70 0.97 1.43</td>
</tr>
</tbody>
</table>
It’s your choice!

- Art & Science versus Trial & Error.

Compromise between patient’s comfort in swallowing and the type and amount of ingredients being encapsulated.

Choose smallest size capsule to accommodate ingredients, “slightly” packed with minimal void space.

Size’s 2 & 3 most common for oral use
Target Weight Selection

**It’s your choice!**

1. Consult “Approximate Capacities of Gelatin Capsules for representative Drugs and Chemicals” Table.
2. Choose a representative substance from the table with a density similar to that of the ingredient present in the greatest quantity in the formulation.
3. From the table determine the *maximum* capacity in grams
4. Multiply the maximum weight by 75% to determine the *minimum* weight
5. Select a target weight that falls **between** the maximum and minimum capacity.
   - Choose a weight that’s practical and easy to work with!

**Common Selections**

- Size 3, Max = 280 mg and Min (75%) = 210 mg, so use 250 mg
- Size 2, Max = 350 mg and Min (75%) = 263 mg, so use 300 mg
- Note: the greater the target weight, the larger the allowable error.
  - 5% of 250 mg is 12.5 mg compared to 5% of 300 mg which is 15 mg

**The difference between the selected target weight per capsule and the amount of active drug per capsule will need to be made up through the addition of an inert powder such as lactose.**
- For example, 300 mg (target weight) - 50 mg (active drug) = 250 mg lactose per capsule
Example Capsule Rx Calculations

Rx: 10 mg Drug Z per capsule, dispense #10 for adult patient, with bulk source of Drug Z and using lactose as an excipient.

1. Base calculations on the preparation of two extra capsules, thus 12 capsules total
2. 10 mg/capsule x 12 caps = 120 mg Drug Z
3. Select a capsule size
   • Remember, it’s your choice, here choose #3

4. Consult “Approximate Capacities of Gelatin Capsules for representative Drugs and Chemicals” Table to determine capacity of capsule size selected based on primary component (lactose)
   • Maximum weight for size 3 capsule and lactose = 0.280 g or 280 mg
   • Minimum weight for size 3 capsule is 0.280 g x 75% = 0.210 g or 210 mg

5. Target Weight selection range = 210 mg to 280 mg
6. Logical target weight choice = 250 mg Note: allowing 5% error gives 238 mg – 263 mg range

7. Calculate total weight of powder needed to fill 12 capsules, 250 mg x 12 caps = 3000 mg
8. Calculate amount of lactose two weigh, 3000 mg (total) - 120 mg (Drug Z) = 2880 mg of Lactose
9. Fill or Punch a total of 10 capsules to a final weight between 238 mg and 263 mg
Compounding Goals

- Accuracy
- Fine particle size
- Thorough Blending (powder must be homogenous)
- Proper Capsule Size Selection
- Aesthetic Appearance
Methods of Preparation

- Hand Filling (Punching)
  1. Calculate
  2. Weigh components
  3. Mix and blend
  4. Block powder
  5. “Punch” or “Scoop”
  6. Weigh for accuracy
  7. Secure and lock cap
  8. Polish
Capsule Weighing Procedure: Digital Balance

1. Place balance on smooth, level surface
2. Ensure weighing pan is clean
3. Zero (tare) the balance
4. Place weighing boat or paper and an empty capsule on weighing pan (ensure same size capsule)
5. Re-zero (re-tare) the balance. After this step do not touch the tare button again during the weighing operation
6. Remove empty capsule but leave weigh boat on balance. The digital display will read a negative value which represents the weight of the empty capsule shell
7. Weigh filled capsule (handle with tongs)
8. Add or remove powder until target weight obtained

Suggestions: 1) don’t cap tightly and 2) weigh within margin of error
Capsule Weighing Procedure:
Torsion Balance

1. Zero the weight dial
2. Ensure pans are clean
3. Using the leveling feet, level the balance bringing pans to equilibrium
4. Place weighing boats or paper on each pan
5. Re-establish equilibrium using the leveling feet. After this step, do not touch the leveling feet again during this weighing operation
6. Place empty capsule on RIGHT balance pan
7. Dial in target weight. The dial will add this weight to the right balance pan
8. Weigh filled capsule on LEFT balance pan
9. Add or remove powder until target weight obtained

Suggestions: 1) don’t cap tightly and 2) weigh within margin of error
Methods of Preparation

- Capsule Filling Machines (e.g. Jaansun®)
Preparation guidelines

Quantity to Prepare – USP Chapter 795
• Solid dosage forms
  “prepare an amount of the total formulation sufficient to allow the prescribed amount or quantity to be accurately dispensed”
• Practically
  • Loss is common during formulation
  • *Always* prepare excess
• Lab
  • Always base calculations on a *minimum of 2 extra capsules*

Beyond Use Dating – USP Chapter 795
• 6 month/25% rule – “The beyond-use date is not later than 25% of the time remaining until the product’s expiration date or 6 months, whichever is earlier.”
Documentation and Labeling

 предпочение: Prescription Documentation

- Record the size and color of the capsules on the front of the Rx.
  - The number of the capsule size is usually written inside a triangle (Δ) and the capsule color recorded beneath it.
- Note any excess controlled substance.

 предпочение: Labeling

- Weight of active drug per capsule (e.g. “Drug Name XX mg Capsules”)

![Image of prescription and labeling example]