

ADMINISTRATION

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ADMINISTRATION

Primary Disciplinary Field(s): Pharmacology, Medicine, Secondary: Psychology, Management Science

1. Core Definition and Contexts

The concept of **administration** fundamentally refers to the regulated process of providing or applying a specific substance, intervention, or structured activity to an individual or group for diagnostic, therapeutic, or evaluative purposes. In the medical and pharmacological fields, which represent its most common technical usage, administration describes the act of introducing a drug, compound, or narcotic into a biological system--often the human body--for the identification, management, or treatment of a disease or ailment. The method chosen for introduction is critical, as it profoundly influences the drug's effectiveness, the speed of its onset of action, and its potential side effects. The goal is always to achieve an appropriate concentration of the active agent at the target site while minimizing systemic toxicity, a balancing act governed by principles of pharmacokinetics.

Beyond the clinical environment, the term **administration** also finds significant application in academic and organizational settings. In these contexts, it relates to the careful management and execution of standardized procedures, such as the regulation of personnel, resources, or, notably, the delivery of psychological and educational assessments. For instance, **test administration** mandates strict adherence to protocols to ensure the validity and reliability of assessment results. Whether administering a medication or a psychological inventory, the overarching principle remains the same: the controlled, intentional application of an external factor to achieve a predictable and measurable outcome.

The definition provided in source materials highlights two main facets. The first, and most detailed, pertains to pharmaceutical practices, emphasizing the diverse range of routes available--from applying medicine directly to a wound (topical) to systematic delivery via inhalation or injection. The second facet serves as a cross-reference, acknowledging the procedural application involved in standardized evaluation, thereby showcasing the versatility of the term across disciplinary boundaries, though the clinical application typically demands a deeper level of technical understanding regarding biological pathways.

2. Routes of Administration: Topical and Local Methods

Topical administration represents one of the most direct and localized means of delivering medication. This method involves placing medicines directly onto the surface of a wound, skin ailment, or specific external mucous membrane, such as the eye or ear canal. The primary

advantage of **topical administration** is the ability to achieve high local concentrations of the drug at the site of pathology while minimizing systemic exposure, thereby reducing the risk of widespread adverse effects. Examples include creams, ointments, patches (transdermal, though sometimes intended for systemic effect), and medicated drops.

While superficial application is the most recognized form of topical delivery, localized medicinal approaches can also be completed via internal routes designed for regional effect, rather than immediate systemic absorption. These routes include application to mucous membranes in the mouth (oral, e.g., lozenges for throat pain), the rectum (suppositories for hemorrhoids), or the vagina (creams or pessaries for localized infections). In these cases, the drug is intended to act primarily on the tissues of the cavity or orifice where it is placed, achieving a focused therapeutic effect before or instead of being absorbed into the general circulation.

A variation of local administration involves sublingual (under-the-tongue) or buccal (in the cheek pouch) routes. Although these routes technically involve the absorption of the drug through the highly vascularized mucous membranes and often lead to rapid systemic effects, the initial placement is localized. These methods are frequently chosen when immediate action is necessary or when the drug would be severely degraded by digestive enzymes or the liver's first-pass metabolism if taken orally. For instance, nitroglycerin for acute angina is often administered sublingually to ensure quick absorption and bypass hepatic processing.

3. Routes of Administration: Systemic and Parenteral Methods

Systematic administration refers to methods designed to ensure the drug reaches the bloodstream and is distributed throughout the body to reach a distant target site. The most common systemic route is oral ingestion, where drugs are absorbed primarily through the gastrointestinal tract. While convenient, the oral route is subject to significant variability due to factors such as gastric pH, food intake, and the phenomenon of **first-pass metabolism**, where the drug is metabolized by the liver before it reaches the systemic circulation, often necessitating higher dosages.

Parenteral administration encompasses all methods that bypass the digestive tract, typically involving injection. These routes are preferred when rapid onset of action is required, when the drug cannot be absorbed orally (due to instability in gastric acid or poor permeability), or when the patient is unable to swallow. The use of a **syringe** is central to these methods. Intravenous (IV) administration delivers the drug directly into a vein, providing immediate and complete (100%) bioavailability, making it the fastest and most controlled route for systemic effect. IV administration is often utilized with the assistance of a continuous infusion via an IV line.

Other critical parenteral methods include intramuscular (IM) and subcutaneous (SC) administration. IM injections are administered directly into muscle tissue, which has a relatively rich

blood supply, allowing for steady absorption over time, suitable for vaccines or depot formulations. Subcutaneous injections are given just beneath the skin into the fatty tissue. SC administration typically results in slower absorption than IM or IV, but is useful for self-administration (like insulin) and drugs that require sustained release. The source notes that the administration of certain injections, particularly those delivered rapidly or into sensitive areas, may cause a **burning sensation** under the skin, a common side effect of local tissue irritation.

Finally, inhalation represents another vital systemic administration route, particularly for volatile anesthetics or bronchodilators. Drugs inhaled into the lungs can be rapidly absorbed through the vast surface area of the alveolar membranes, offering quick entry into the systemic circulation, often rivaling the speed of IV delivery, particularly for gases and finely dispersed aerosols.

4. Pharmacokinetic Implications of Administration

The chosen route of administration is the single most important variable determining the pharmacokinetics of a drug--specifically its absorption, distribution, metabolism, and excretion (ADME). For a drug to be effective systemically, it must first be absorbed into the plasma. IV administration skips the absorption phase entirely, resulting in immediate peak concentration, whereas oral, IM, or SC routes require the drug to cross biological membranes, leading to a lag time before the therapeutic concentration is reached.

The bioavailability, defined as the fraction of an administered dose of unchanged drug that reaches the systemic circulation, is heavily route-dependent. Oral administration often results in significantly reduced bioavailability due to pre-systemic clearance (first-pass metabolism) in the gut wall and liver. Conversely, **parenteral administration** methods like IV guarantee 100% bioavailability, while IM and SC routes yield high but often slower bioavailability curves. Selecting the correct route is therefore a nuanced clinical decision balancing the need for rapid onset versus sustained therapeutic effect, and maximizing bioavailability while minimizing metabolic burden.

Furthermore, the route influences distribution. Highly lipid-soluble drugs may distribute quickly across the blood-brain barrier following IV administration, while the slower absorption profile of a subcutaneous injection might allow for more gradual distribution, potentially reducing acute central nervous system side effects. Clinicians must meticulously evaluate these factors to tailor the administration strategy to the specific pharmacological properties of the compound and the individual patient's physiological status.

5. Administration in Psychological and Educational Testing

In the fields of psychology, education, and management, administration refers to the standardized delivery of tests, surveys, and research protocols. Known specifically as **test administration**, this process requires careful planning and execution to ensure that all participants experience the exact

same conditions, thereby upholding the principles of reliability and validity. Deviations in timing, instructions, environment, or the presence of the administrator can introduce bias and render the results meaningless.

Standardization in test administration is paramount, particularly for high-stakes assessments or clinical psychological evaluations, such as intelligence or personality tests. The administrator must be thoroughly trained in the specific procedures outlined in the test manual, including precise phrasing for instructions, handling allowable or non-allowable participant queries, and maintaining a consistent, neutral testing environment. This strict procedural rigor ensures that differences in scores are genuinely attributable to differences in the constructs being measured (e.g., ability or knowledge) rather than variations in the administrative context.

Modern administration methods increasingly utilize technology. Computer-based test administration allows for enhanced standardization, automated scoring, and adaptive testing methodologies, where the test items presented adjust based on the test-taker's performance. However, even technologically mediated administration requires oversight to ensure factors like hardware functionality, internet connectivity, and proctoring integrity are maintained to the same high standard required for traditional paper-and-pencil assessments.

6. Significance and Clinical Impact

The clinical impact of correct administration procedures cannot be overstated, as the success of any therapeutic intervention hinges on the drug reaching its target in sufficient quantity. Errors in administration, such as administering a drug via the wrong route (e.g., injecting an IV-only drug intramuscularly) or using an incorrect dosage form, are common sources of medical error with potentially fatal outcomes. Therefore, protocols surrounding drug administration—including verification of the drug, dose, patient, time, and route (the "Five Rights")--are foundational to patient safety.

Furthermore, the route of administration often defines the feasibility of long-term patient compliance. For chronic conditions, an easy route like oral medication is preferred. However, for biological agents or drugs that must maintain a steady state and cannot be taken orally, alternative routes like self-administered subcutaneous injections (e.g., for certain autoimmune diseases) or transdermal patches enhance quality of life and adherence outside of a hospital setting. The evolution of drug delivery technology is constantly focused on developing novel administration methods that improve patient outcomes, reduce invasiveness, and increase ease of use.

Further Reading

[Route of administration \(Wikipedia\)](#)

[Parenteral administration \(Wikipedia\)](#)

[Pharmacokinetics \(Wikipedia\)](#)

[Drug Administration Routes \(U.S. Food and Drug Administration\)](#)

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