

Strategies for Developing and Commercializing Next Generation Medical Devices

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The emergence of combination products is changing the medical device landscape. Defined as two or more regulated components - drugs, medical devices, or biologics - combined through physical or chemical means, combination products inherently require two separate skill sets for development. Whereas medical device companies used to possess 100 percent of the expertise needed to develop a product, they must now share product development ownership with a biotech/pharmaceutical partner. The shared development model intensifies every aspect of product development from IP and regulatory issues to packaging and marketing strategy. For these and many other reasons described in this article, it is critical that products are well-targeted.

With countless combinations of device, pharmaceutical drug and/or biologic, the opportunities in this market are exponential. However, in order to be successful, a product must not only satisfy a real market need, but it must also be uniquely different from anything the competition has to offer.

Assessing Market Demand

Accurately assessing market demand is the first step toward developing a successful product. As with the entire product development process, medical device companies can benefit from using an external design engineering firm to conduct market research. Objectivity is a central ingredient in research and with no financial stake in the technology or device, an external engineering firm fits this profile.

There are several effective ways to establish needs in the market using customer and market research. These include one-on-one interviews, focus groups, telephone surveys, and conjoint and factor analyses. With conjoint analysis, medical device companies can gain insight into how tradeoffs are made between competing characteristics of a product by evaluating how customers value product attributes individually and in a group. For example, if one characteristic diminishes the value of another, then a conjoint analysis will help identify which attribute is more important. By contrast, factor analysis focuses on grouping product characteristics together to determine which set of attributes has the greatest appeal. Finally, focus groups are very helpful in idea concept testing and understanding the healthcare environment.

It is critical to prioritize end-user needs according to relative importance to avoid developing a product that has unwanted features or is too costly. Identifying customer dissatisfaction with current products can also help companies avoid making the same mistakes as their competitors.

Bringing New Products to Market

More than just identifying markets needs, combination product makers must consider the accessibility of the product to its target audience. For example, if a product is targeted for Type 2 diabetes, then product developers should consider the elderly population a primary market, and make obtaining national coverage and reimbursement from the Centers for Medicare and Medicaid Services (CMS) a top priority.

Since CMS will require evidence that the combination product will provide a clinically more effective therapy than is currently offered, combination product makers should identify clear differentiators at product concept. Similarly, CMS wants companies to demonstrate that the combination product will provide a significant health benefit. Product developers should, therefore, have some way of measuring the health benefits of their products. Although CMS is not supposed to consider cost when making a national coverage decision, there are recommendations for it to begin doing so. Combination product developers would be wise to design with cost in mind not only to preempt any decisions CMS may make in the future, but also to minimize threats from competing products.

Because CMS coverage will greatly influence physician adoption of the combination product, companies are advised to begin the reimbursement process as early as possible. This will help to decrease the lag time between FDA approval and CMS coverage, allowing the combination product to reach its target populations sooner.¹

Although CMS has not defined a coverage decision process for combination products yet, following these guidelines will help steer the current generation of products in development towards CMS coverage.

With so many combination products in development right now, the challenges of introducing an original product in this market are multiplied. While development of combination products will require the formation of partnerships with biotechnology and/or pharmaceutical companies, medical device companies can also benefit greatly from involving an external engineering firm throughout the entire development process. Unlike medical device companies or their pharmaceutical partners, an outside engineering firm with multidisciplinary expertise possesses specialized knowledge of manufacturing, design, and regulatory issues for both industries. This dual-industry understanding gives outside experts the unique ability to engineer breakthrough concepts and anticipate potential problems that would not otherwise be obvious to either company.

While IP sharing is an inherent part of combination product development, working with a neutral engineering partner can minimize IP issues between medical device and pharmaceutical companies, while ensuring confidentiality and protection of the intellectual property of the products it develops. Engineering partners should advise and encourage pharmaceutical and medical device customers to apply for patents both separately and together for the drug, the device and the combination of the two to ensure that each company's proprietary technologies are protected.

Designing for Manufacturability

As two separate regulated components, combination products present unique manufacturing challenges. Beyond the physical design challenges of combining the two entities, sterilization, validation and drug/device interaction issues further complicate the development process. In addition, if chemicals, known as extractables and leachables migrate from plastic medical device components, drug products can become contaminated.

G.D. Searl's transdermal nitroglycerine patch used to treat patients with angina is an example of a combination product where the device and drug are one entity

Since traditional device sterilization procedures, such as ethylene oxide gas (EtO), can render drugs ineffective, new strategies may need to be developed to ensure product sterility, especially for biological drugs.

Primary Mode of Action (PMOA) is defined as the single mode of action of a combination product that provides the most important therapeutic result. While each combination product has a PMOA, which determines its assignment to one of three FDA regulatory centers for review, the process of defining the PMOA can be complicated in and of itself. To minimize regulatory confusion, it is best to establish an intended PMOA at the outset of the project. Of the three agencies to which a product can be submitted – the Center for Biologics Evaluation and Research (CBER), the Center for Drug Evaluation and Research (CDER), or the Center for Devices and Radiological Health (CDRH) – the CDRH is often considered the shortest and clearest route to regulatory approval.² Given the differences in scale, timeliness and other matters, device and pharmaceutical companies may not always agree on PMOA. It is therefore beneficial to consult with experts, including regulatory counsel.

Regardless of whether the product is a combination device, traditional medical product or an innovation in an altogether different market, planning for manufacturing should begin as soon as a product concept is developed. This will avoid developing a product that is extremely difficult to manufacture. It will also enable the company to determine whether standard equipment, a modified version of it, or a unique proprietary system will be required for manufacturing. For example, discovering that a product cannot be manufactured on standard equipment once the prototype has been finalized comes at a stage in the process when changes to either the product or the production machinery will be costly and time-consuming.

Just as an external engineering partner can recommend standard manufacturing equipment and customize proprietary solutions, it can also help medical device companies select a manufacturing partner to produce the product. Selection of manufacturing partners will depend largely on the technology planned for use in the device and the materials from which it will be constructed. In the case of combination products, more than one manufacturing partner is often required due to the complexity of the product.

New Paradigms in Packaging

Packaging combination products is equally as challenging as designing, developing and manufacturing them. Most combination products will require special barrier properties to protect pharmaceutical or biologic components from moisture and oxygen. For example, some drugs may require refrigerated storage to preserve their shelf life.

Since combination products can be used anywhere in a hospital or healthcare environment, packaging requirements will vary greatly depending on their intended use. For example, a double sterile barrier is required for devices that are used in operating rooms, whereas a single package is suitable for devices that are used in patient rooms.

Combination product companies must consider manufacturing early in the development process.

As mentioned earlier, the integration of two different regulated entities complicates sterilization processes. Most drugs cannot withstand the high heat and humidity of ethylene oxide gas (EtO) typically used to sterilize medical devices in their packages. Combination product manufacturers will need to identify other suitable methods of sterilization, such as gamma irradiation, electron beam or UV sterilization.

Conclusion

Medical device and pharmaceutical companies have a unique opportunity to establish themselves as leaders in the burgeoning combination products market. With the exception of medical and pharmaceutical giants like Johnson & Johnson, in many cases the most successful companies are not necessarily the most innovative, but rather the ones that are best at partnering and collaborating. This is because in the world of combination products, a medical device is only as innovative as its other half – the pharmaceutical component.

Outsourcing can help bridge the gap between the pharmaceutical and medical device industries by fostering collaboration and innovation among companies that often don't see eye- to-eye. External engineering firms possess the multidisciplinary expertise needed to understand both sides of the combination product equation, and can fill the knowledge gaps while ensuring IP protection.

About the Author

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