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Assessing the Financial Benefits of Faster Development Times: The Case of Single-source Versus Multi-vendor Outsourced Biopharmaceutical Manufacturing

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ABSTRACT

Purpose: The extent to which new drug developers can benefit financially from shorter development times has implications for development efficiency and innovation incentives. We provided a real-world example of such gains by using recent estimates of drug development costs and returns.

Methods: Time and fee data were obtained on 5 single-source manufacturing projects. Time and fees were modeled for these projects as if the drug substance and drug product processes had been contracted separately from 2 vendors. The multi-vendor model was taken as the base case, and financial impacts from single-source contracting were determined relative to the base case.

Findings: The mean and median after-tax financial benefits of shorter development times from single-source contracting were $44.7 million and $34.9 million, respectively (2016 dollars). The after-tax increases in sponsor fees from single-source contracting were small in comparison (mean and median of $0.65 million and $0.25 million).

Implications: For the data we examined, single-source contracting yielded substantial financial benefits over multi-source contracting, even after accounting for somewhat higher sponsor fees. (*Clin Ther.* 2018;▮:▮▮▮–▮▮▮)

Key words: biopharmaceutical net returns, biopharmaceutical R&D cost, contract manufacturing, drug development time.

INTRODUCTION

Drug development sponsors are focusing substantial attention and resources on improving research and development (R&D) efficiency to combat long-standing operating challenges. These challenges include the high and rising out-of-pocket costs of developing a new molecular entity; long development cycle time durations associated with clinical testing from first-in-man studies through regulatory submission, review, and an approval decision; and high and rising development risk reflected in the very low observed success rates for new molecular entities ultimately obtaining regulatory approval.[1]

Numerous strategies and solutions are being planned and deployed to optimize drug development performance and economics. Clinical supply sourcing is one area currently receiving much attention. Traditionally, the tasks and activities supporting the preparation and manufacture of investigational drugs for use in clinical testing have been handled by a fragmented collective of independent contract providers. Sponsor companies select independent providers based on their specialized capabilities and experience. Although this multi-vendor approach favors matching the needs of the development project with provider expertise, it is inherently less efficient, as more time is needed to identify, select, negotiate, and engage individual contractors. Communication, technology, and knowledge transfer between independent parties is also less efficient.

Public pressures and accelerated regulatory approval pathways are intensifying the need to achieve time savings and improve efficiency. Abridged regulatory pathways are intended to allow breakthrough therapies to reach the market, and the patients who need these treatments, sooner. However, these pathways

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often strain contract manufacturers vying to keep up with sponsor requirements.[2]

In recent years, single-vendor contract development and manufacturing organizations (CDMOs) have presented a compelling new approach to address an inefficient multi-vendor approach. Single-source —"one-stop"—CDMOs are fully integrated, offering a wide range of services, expertise, and capabilities. Most single-source CDMOs are the result of horizontally integrated infrastructure and capabilities through acquisitions. Notable examples include Catalent's acquisition of Pharmapak Technologies, Micron Technologies, and Redwood Bioscience; Patheon's merger with DSM to form DPx followed by the acquisition of Gallus Biopharmaceuticals[3]; AMRI's acquisition of Euticals; and Aenova's acquisition of Haupt Pharma AG.[4]

There are several efficiencies promised by a single-source CDMO. First, the model accommodates running multiple steps in tandem, such as formulation development, in vitro tests, animal tests, and preclinical studies.[5] The model allows for characterization studies to be completed earlier and for a molecule to be optimized sooner, resulting in earlier identification of molecules likely to fail and potentially saving sponsor companies significant time and investment. A single-source CDMO model may also increase efficiency by eliminating the need for multiple contract negotiations, limiting technology transfers, and by removing the need for revalidation measures.

Although the single-source CDMO model offers compelling advantages, these advantages are largely conceptual and anecdotal. To our knowledge, no scholarly studies have systematically evaluated their impact. In response, we conducted the present study comparing multi- and single-vendor CDMO models on development economics and cycle time. It is our hope that the results of this study will inform managers involved with clinical manufacturing decisions, as well as demonstrate in general the extent to which reducing biopharmaceutical development cycle times can lower costs and increase returns, regardless of how the time reductions may be achieved.

DATA

We conducted 7 interviews with industry experts on the use and potential for single-source contract manufacturing to help guide our inquiry. We then gathered data from a CDMO, Patheon, Inc. Patheon is part of Thermo Fisher Scientific and is a leading provider of outsourced pharmaceutical development, clinical trial logistics, and manufacturing services. We gathered data on 5 single-source contract manufacturing projects that Patheon had recently undertaken for drug sponsors that collectively covered all 3 clinical development phases and both monoclonal antibody (mAb) and small molecule development. (The company had contracted for 12 one-source projects, but only 5 had comprehensive information to date.)

All of the projects were initiated in July 2015 and later (Table I). Three of the projects involved manufacturing contracts for Phase I clinical trials, one for Phase II trials, and one for Phase III trials. Three of the projects involved the development of mAbs, and 2 were for small molecules. Data were provided on 37 distinct phases, including 23 for drug substance manufacturing (DS) and 14 for drug product manufacturing (DP). The data consisted of timelines for the phase (many of which overlap) and fees charged sponsors for various manufacturing phases. All of the sampled projects met Good Manufacturing Practice standards of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use for the United States and European Union marketing. These single-source projects were also modeled to yield expected timelines and fees as if they were instead contracted with 2 vendors instead of 1 (the multi-vendor case used here), with one covering DS and the other covering DP. Thus, the multi-vendor case is one in which contracting is sequential.

Table I. Data characteristics: sample of single-source projects.

Compound	Phase	Molecule Type	Route of Administration
1	I	mAb	Sterile injectable
2	I	mAb	Sterile injectable
3	I	Small molecule	Tablet
4	II	Small molecule	Capsule
5	III	mAb	Sterile injectable

mAb = monoclonal antibody.
Source of data: Patheon.