Medical product development: Combining the Fun (development) with the Necessary (regulatory compliance)

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Medical Product Development Phases

Funding Phase (NECESSARY – someone has to bankroll the project!):

- Idea: Unmet need
- Market potential
- IP landscape (Own vs Prior art)
- Regulatory roadmap (510k or PMA?)
- Are clinical studies required? Reimbursement?
- Schedules
- Budgets
- If start-up, valuation model

Concept Phase:

- Specifications: Marketing Spec, High-level Product Spec
- Risk analysis
- Updates:
  - IP – start filing patents
  - Regulatory roadmap
  - Clinical/reimbursement
  - Schedules
  - Budgets
Medical Product Development Phases

Development Phase (REAL FUN!!!)
- Lower-level specifications: Hardware, Software, Mechanical Specs
- Traceability matrix
- Actual design/development (MOST OF THE FUN!!!)
- Build and test engineering prototypes
- Specification freeze
- Design freeze
- Verification and validation test protocols

Verification & Validation Phase (NECESSARY)
- Verification – testing against specifications
- Validation – test per intended use
  - Schedules should allow for V&V iterations – rarely does a product pass V&V from first attempt
- Regulatory submissions and approvals (FDA, CE, MHLW - Japan)
- Preparation for Production Phase:
  - Release documentation to production level revisions
  - Production fixture design/validation

Production Phase (FUN, you get to build your design on a larger scale!)

Market Release Phase (FUN & NECESSARY, you get to see your design in action!)
Medical Product Development FUN vs. NECESSARY

Rule of thumb:

¬ 30 % FUN activities (design, prototyping, production, clinical use)

¬ 70 % NECESSARY (finding money, paperwork, formal testing, regulatory approvals, protect against litigation)
Why ~ 70% spent on Necessary not on Fun?

Top Ten Concerns Companies have to deal with:

- FDA Regulatory Requirements: 84.0%
- Cost of Clinical Research: 74.1%
- Medicare Coverage & Reimbursement Requirements: 71.6%
- R&D Costs Related to Expansion/Contraction into New Markets: 66.7%
- U.S. Private Payer Coverage & Reimbursement Requirements: 63.9%
- International Regulatory Requirements: 56.8%
- Litigation Risks & Costs: 54.3%
- R&D Costs Related to Acceptance in Existing Markets: 54.3%
- Availability/Cost of Capital Funding: 53.1%
- Sales, General & Administrative Related to Expansion/Contraction into New Markets: 46.3%
Why ~ 70% spent on Necessary not on Fun?

- Having the right product idea (the FUN!) is not one of the top ten concerns

- Increasingly, companies have to spend their resources (e.g. money/time) to address some of the NECESSARY:
  - Regulatory approvals
    - If not approved, even an excellent product idea has little practical benefit
  - Reimbursement
    - Somebody has to reimburse doctors and hospitals for using your product
  - Litigation
    - Getting IP protection is critical
Regulatory Approvals

In the US, the FDA is caught between the proverbial rock and a hard place:

- The FDA has to ensure that approved products are safe and efficacious for patients.
- At the same time, they have to meet performance targets related to the amount of time required to render approval/rejection decisions.

As a result:

- Total review times for 510(k) submissions have increased by more than 55 percent since 2005 (source: the FDA).
- The average cost to bring a low-to-moderate 510(k) product from concept to market is $31 million. More than 77 percent of that, $24 million, was spent on FDA-dependent or related activities.
- High-risk PMA costs averaged $94 million, with $75 million spent on FDA-linked stages, nearly 80 percent of the total cost of bringing devices to market (source: the Makower/Stanford University report).
Regulatory Approvals

Average Time to 510(k) Decision *

Guidant ICD recall ? **
Vioxx recall ? **

* source: FDA CDRH report July 19, 2011

** added by me, not in the FDA report. No causality inferred, just timing coincidence reflected.
Reimbursement

It is critical for a product’s success to be reimbursable, or covered by medical insurance:

- Else, patients would have to cover the product cost and use from their own pocket.
- In the US, reimbursement is first gained from the Centers for Medicare and Medicaid Services (CMS). Other insurance companies, typically, follow through.

As a result:

- Additional time and resources must be allocated to secure the product’s market and clinical success.
- Reimbursement landscape can shift swiftly, as it may be affected by the outcome of post-market studies or by budgets approved by politicians.
- Companies may be significantly affected, positively or negatively, by changing CMS policies.
Reimbursement

The story of Angiotech Pharmaceuticals, Inc. (Vancouver, Canada):

- Manufacturer of Paclitaxel, a generic version of TAXOL, a drug used in cancer chemotherapy
- Paclitaxel is also used to coat TAXUS, a drug-eluting stent manufactured by Boston Scientific
- In 2003/2004, FDA and Reimbursement approval of TAXUS brought fortunes to Angiotech
- In 2005/2006, as post-market studies revealed concerns about use of drug-eluting stents, both Boston Scientific and Angiotech saw their fortunes reduced
- As Reimbursement prices for drug-eluting stents were significantly reduced by CMS, Angiotech suffered significantly, as Paclitaxel was by far their highest revenue generator:

REUTERS Jan 28, 2011: Canada’s Angiotech to file for bankruptcy

newcardio
Intellectual Property (IP) strategy

Some typical IP costs:

- IP attorney fees: $250 - $750/h
- $2000 - $10,000 attorney fees to write, prepare and file one US patent application
- $2000 - $8000 attorney fees for prosecuting one US patent (2 – 3 year process)
- Approx. total cost for one US patent (filing+prosecution+maintenance): $15,000 - $30,000

As a result:

- Companies have to aggressively protect and defend their technologies and product
- Filing patents takes significant time and money
- Patents can be under Patent Office examination for more than 2 – 3 years before issuance
- Once issued, maintenance costs can be very expensive
- Litigation costs, however, may be much more expensive!

Boston Scientific Agrees to Pay J&J $716 Million in Stent Settlement
**IP strategy**

- Approximate lifetime patent maintenance fees in 2011 USD (lifetime approx 20 years):

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<th>Country</th>
<th>Cost</th>
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<tr>
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- Filing an European patent application and keeping it alive for its maximum 20 year lifetime costs approximately $33,424.82
Conclusion: FUN vs. NECESSARY

- Having FUN is critical for final market and clinical success
  (i.e. FUN = right product idea, high quality engineers and development team)

- But, the NECESSARY has to be planned and accounted for, as it may consume considerable resources from what a company may have at its disposal