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

Dorin Panescu, Ph.D., Fellow IEEE

NewCardio, Inc., Santa Clara, CA

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

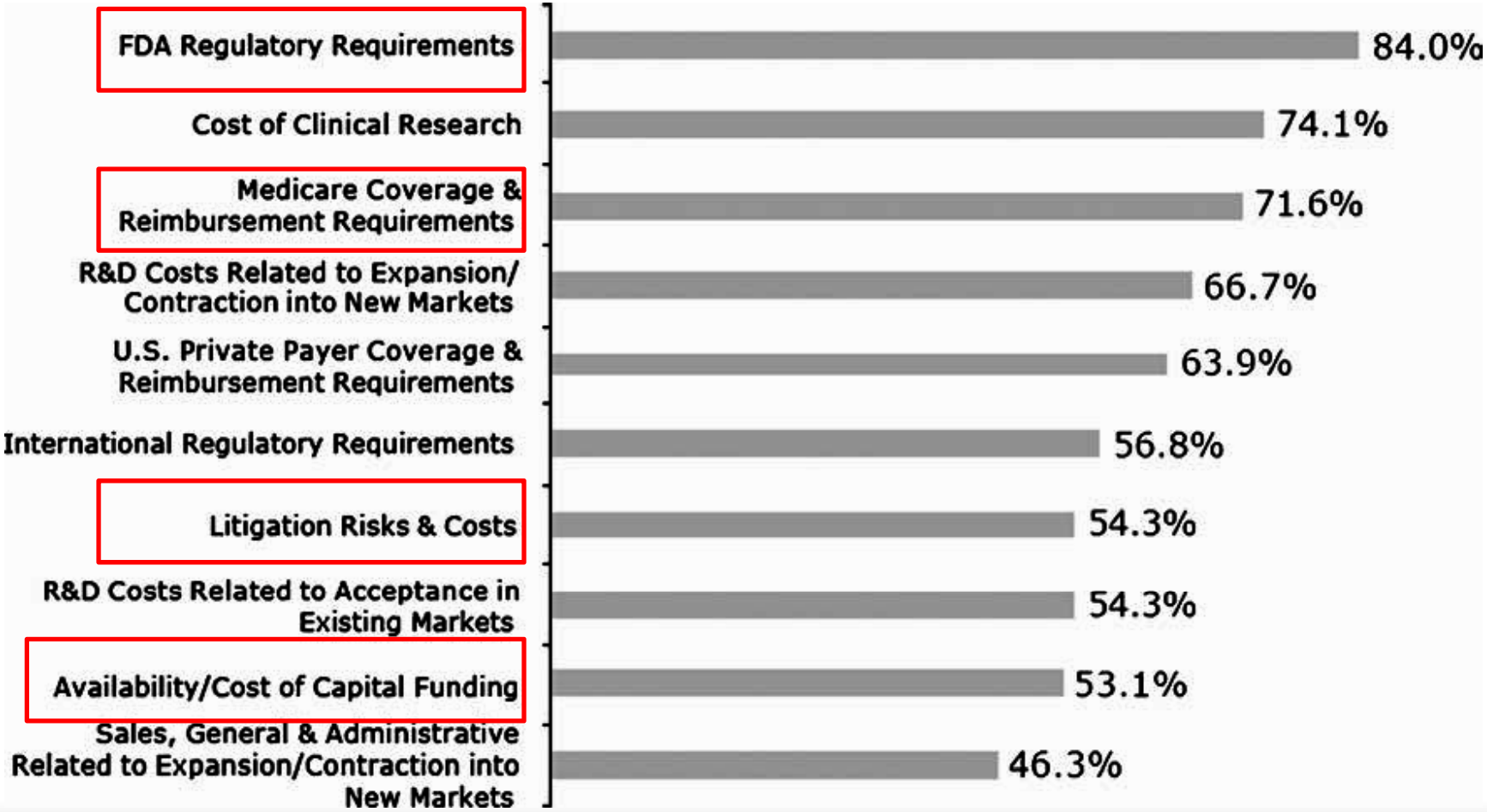
- Development Phase (REAL FUN!!!)
  - Lower-level specifications: Hardware, Software, Mechanical Specs
  - Traceability matrix
  - Actual design/development (MOST OF THE FUN!!!)
  - Build and test engineering prototypes
  - Specification freeze
  - Design freeze
  - Verification and validation test protocols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



Why ~ 70% spent on Necessary not on Fun?

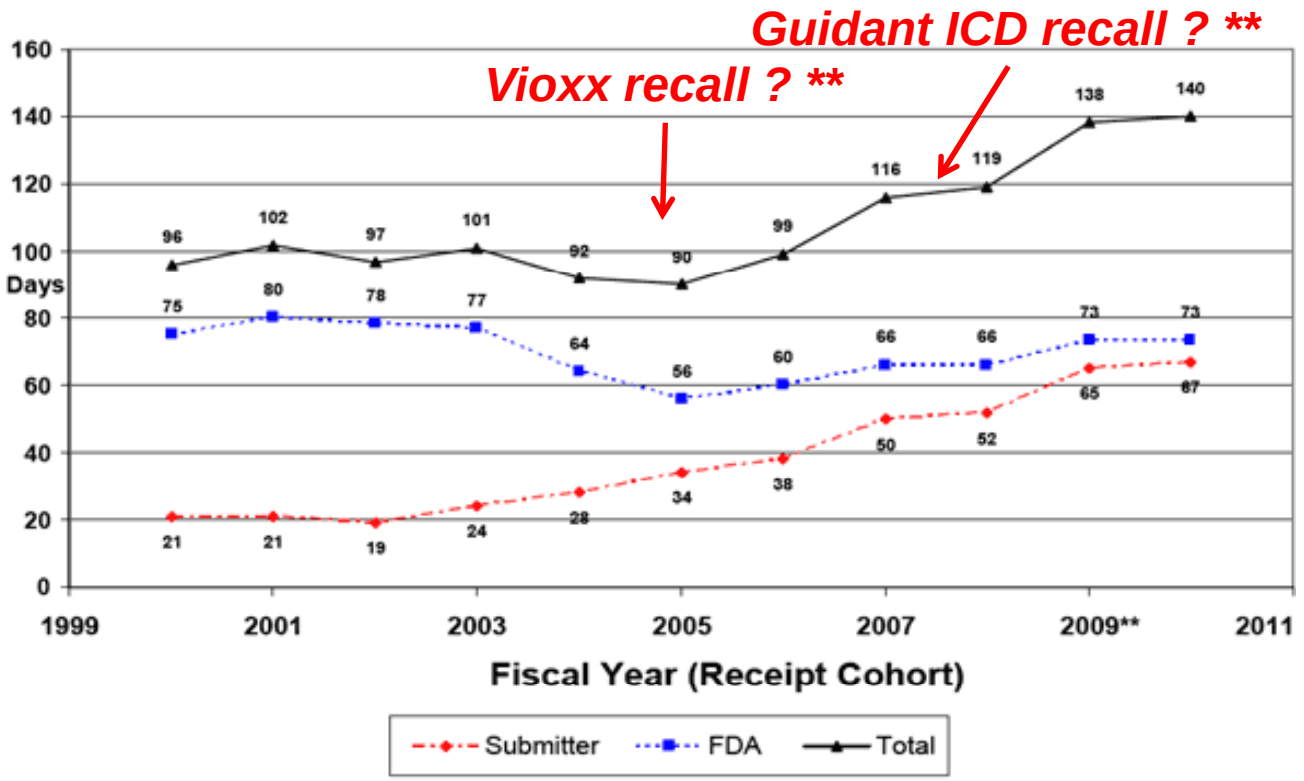
- Having the right product idea (the FUN!) is not one of the top ten concerns
- Increasingly, companies have to spend their resources (e.g. money/time) to address some of the NECESSARY:
  - Regulatory approvals
    - If not approved, even an excellent product idea has little practical benefit
  - Reimbursement
    - 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 *



**** 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*

Reimbursement

FDA/CMS approval **Post-market studies** **Reimbursement drop**

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):
  - Four most expensive countries
  - Four least expensive countries

Germany	$ 21,161.69
Austria	$ 19,537.39
Netherlands	$ 17,978.07
Hungary	$ 17,166.05
US	$ 7,945.00
Venezuela	$ 4,420.00
Israel	$ 4,235.00
South Africa	$ 2,723.40
New Zealand	$ 2,310.76

- 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