AcelRx Pharmaceuticals, Inc.

May 15, 2014

Forward Looking Statements

This presentation contains forward-looking statements, including, but not limited to, statements related to the process and timing of anticipated future clinical and regulatory development of our product candidates, including the timing of potential FDA approval and MAA submission for Zalviso™ and the timing of the Phase 3 trial for ARX-04, the therapeutic and commercial potential of our product candidates, including the potential market opportunity for Zalviso and ARX-04 and our related commercial goals and planned segmentation strategy, potential milestones and royalty payments under the Grüenthal agreement, the expected market growth and patent protection strategy for our product candidates and the sufficiency of our cash resources and our anticipated cash consumption. Forward-looking statements represent our estimates and assumptions only as of the date of this presentation. Actual results may differ materially due to the risks and uncertainties inherent in our business, including any delays or inability to obtain and maintain regulatory approval of its product candidates, including Zalviso, in the United States and Europe, the outcome, cost and timing of our product development activities and clinical trials, including the planned Phase 3 ARX-04 trial; the uncertain clinical development process, including the risk that clinical trials may not have an effective design, enroll a sufficient number of patients, or be completed on schedule, if at all; ability to receive any milestones or royalty payments under the Grüenthal agreement; our plans to research, develop and commercialize our product candidates; our ability to attract additional collaborators with development, regulatory and commercialization expertise; the size and growth potential of the markets for our product candidates; our ability to successfully commercialize our product candidates and the timing of commercialization activities; the rate and degree of market acceptance of our product candidates; our ability to develop sales and marketing capabilities; the accuracy of our estimates regarding expenses, future revenues, capital requirements and needs for financing; our ability to continue obtaining and maintaining intellectual property protection for our product candidates; and other risks detailed in our filings and reports with the SEC including our Annual Report on Form 10-K filed with the SEC on March 17, 2014. You may obtain these documents for free by visiting EDGAR on the SEC's website at www.sec.gov. The statements presented in this presentation speak only as of May 15, 2014. We undertake no duty or obligation to update publicly any forward-looking statements contained in this presentation for any reason.

AcelRx – Improving Acute Pain Management

Strong Zalviso™ profile from Phase 3

- **Efficacy:** effective control of moderate to severe acute pain, rapid onset of action
- **Adverse events:** similar incidence to placebo, low incidence of O_2 desaturation events
- **High patient satisfaction and nurse ease of care:** superior to IV PCA with morphine

Grünenthal partnership to commercialize Zalviso in EU & Australia established

- **Terms:** $250M upfront and potential milestones, mid-teens to mid-twenties % royalty
- **Other Territories:** Continue to seek additional partnerships in Asia, South America

Clear regulatory pathways in US and EU

- **US:** 505(b)2 NDA, CDER lead, CDRH consult, July 27, 2014 PDUFA date
- **EU:** Centralized filing via EMA planned for mid-14, CE mark for device through Notified Body

Assuming timely Zalviso approval, available cash funds operations to breakeven

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- **ARX-04:** Moving to Phase 3 implementation in H2 2014

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Zalviso EU Partnership: Grünenthal GmbH

Grünenthal brings its pain-focused organizational capability to support a successful launch of Zalviso in EU and Australia

- #2 pain company in Europe
- Zalviso success strategically relevant for Grünenthal
- EU pain business growing, 25% growth in 2012 over 2011
- Patient-centric and innovation based culture matches AcelRx culture well
- Mid 2014 centralized MAA submission planned for drug product approval

Attractive deal terms

- $30M upfront payment
- $220M in potential sales and development milestone payments
- Mid-teens to mid-twenties percent royalty on net sales

Zalviso™
(sufentanil sublingual microtablet system)

Proposed Indication: Management of Moderate to Severe In-Hospital Acute Pain

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IV PCA – A Troubled Standard of Care

IV-PCA

- In-hospital, post-operative moderate to severe pain control
- Higher Patient satisfaction when patients control their own pain

Limitations

- IV opioids - unfavorable side effects
  - Sedation, oxygen desaturation, respiratory depression
- Invasive route of delivery
  - IV infiltration causes analgesic gaps
  - IV connection restricts patient mobility
  - Risk of IV site infection
- Programming errors
  - Infusion pumps large source of morbidity / mortality[1]
  - 1/9 harmful hospital errors due to IV PCA[2]

1. FDA / AAMI Summit Meeting held October 2010; *http://www.aami.org/infusionsummit/AAMI_FDA_Summit_Report.pdf*
2. Calculated from "The rate and costs attributable to intravenous patient-controlled analgesia errors." Brian Meissner et al, Hospital Pharmacy April 2009

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Zalviso: Sufentanil NanoTab

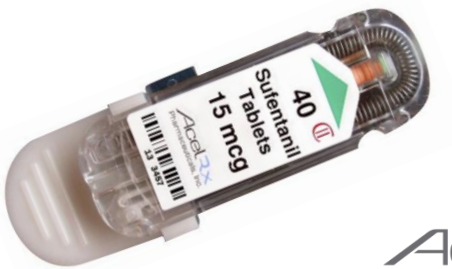
- **High Therapeutic Index Opioid**
  - In animal studies

OPIOID	THERAPEUTIC INDEX
Morphine	71[1]
Hydromorphone	232[2]
Fentanyl	277[1]
Sufentanil	**26,716[1]**

- **High Lipophilicity**
  - Enables rapid transmucosal uptake
  - 6 minute brain:plasma equilibration
- **No active metabolites**

- **Sufentanil NanoTab**
  - Sublingual avoids IV peaks & troughs
  - Small size minimizes swallowed drug
  - Results in high bioavailability
  - Provides consistent dose delivery

- **Supplied in cartridge of 40 NanoTabs**
  - 2 days for average patient



1. Mather, Clin Exp Pharmacol Physiol 1995; 22:833.
2. Kumar, Eur J Pharmacol 2008; 597:39 (ED50) and Purdue Pharma MSDS, 2009 (LD50)

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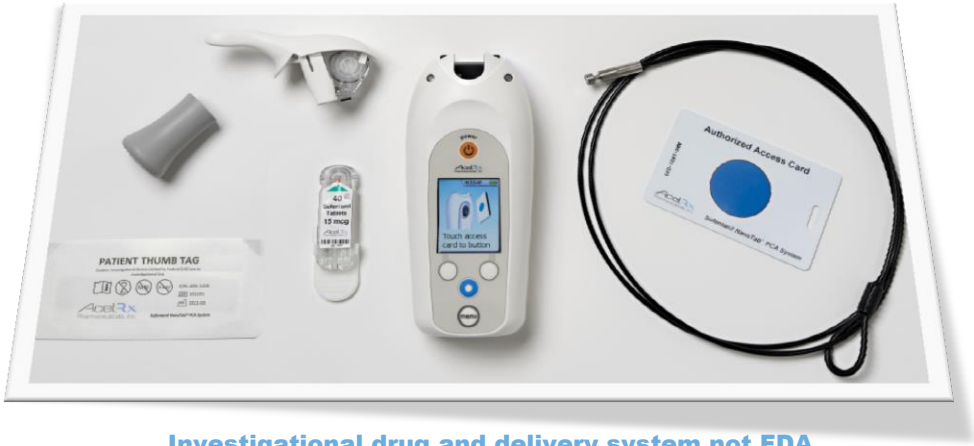
Zalviso: Delivery Device Design and Feature Set

Non-invasive (sublingual) delivery

- Eliminates IV infection risk
- Enhances ease of ambulation

Pre-programmed delivery

- Factory set 20-minute lockout period
- Eliminates programming error risk



Investigational drug and delivery system not FDA approved for commercial use

Design safety features

- Set-up tablet, RFID cartridge provides full inventory loop tracking of NanoTabs
- RFID thumb tag co-located to device prevents proxy dosing
- HCP controlled access, device tether reduces risk of product loss
- Battery power ensures 72-hour function even in the event of power outage

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Zalviso: A strong clinical profile

Strong Efficacy

Faster onset than IV morphine

Sustained pain relief over 48-72 hours

Consistent effect across surgery types

Attractive Tolerability

AE profile similar to placebo

Itching only AE different to placebo

Lower oxygen desaturation rate

High Nurse Ease of Care

No programming

No IV eliminates infiltration alarms

Less bothersome, time consuming

High Patient Satisfaction

Patient control heightens satisfaction

Rapid onset controls pain quickly

No IV supports easier ambulation

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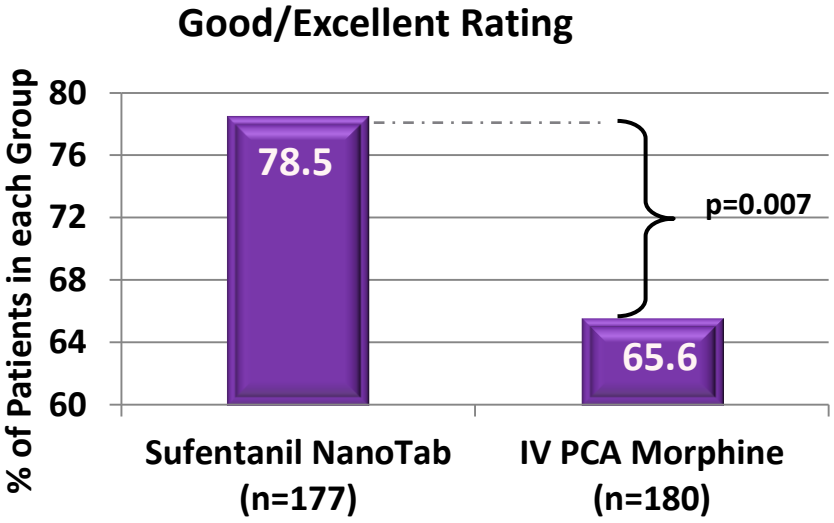
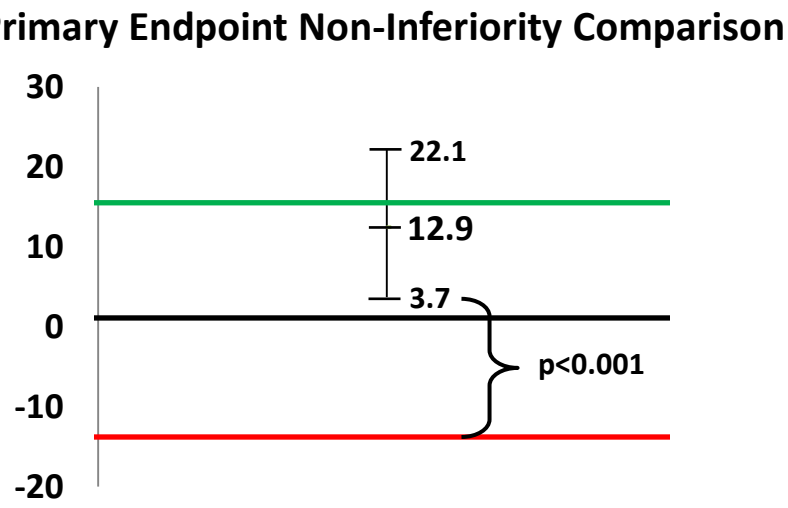
Zalviso Non-Inferior and Superior to IV Morphine

Patient Global Assessment – 48 hours (ITT Population)





- PGA 48 among completers demonstrates superiority for Zalviso
- PGA 24 and 72 hour also statistically superior in favor of Zalviso

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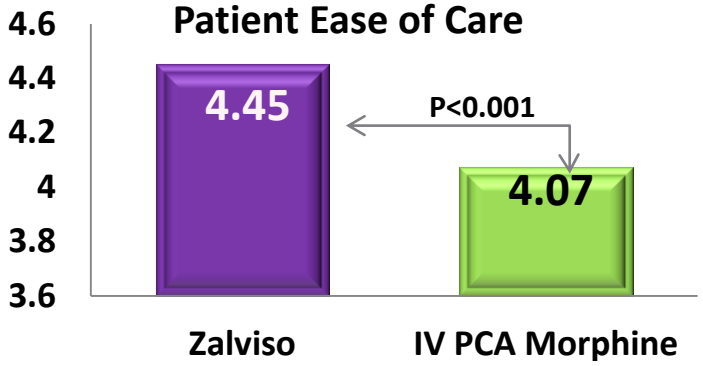
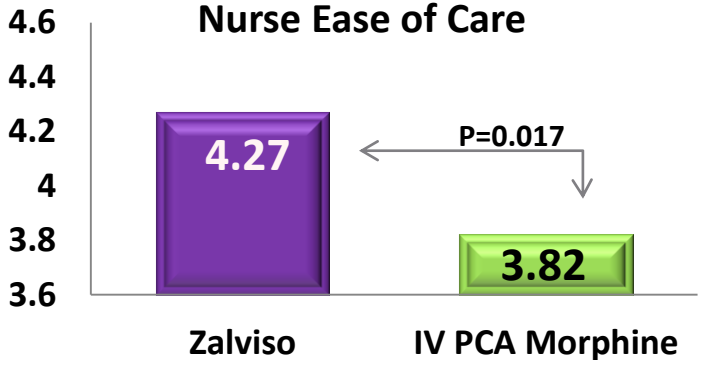
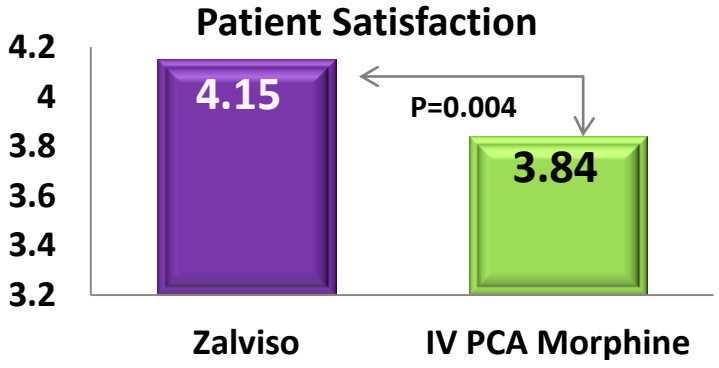
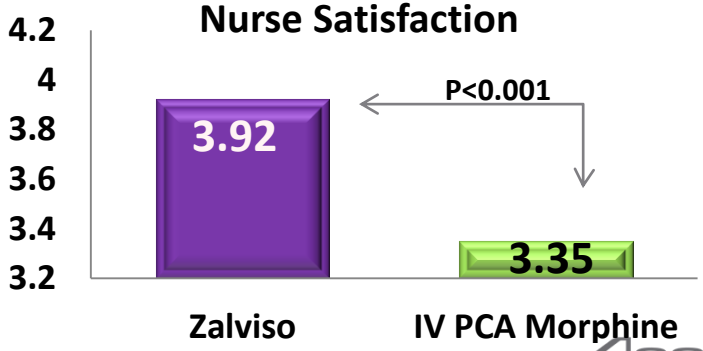
High Patient Satisfaction & Nurse Ease of Care









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IAP 309: Ease of Care Subscales

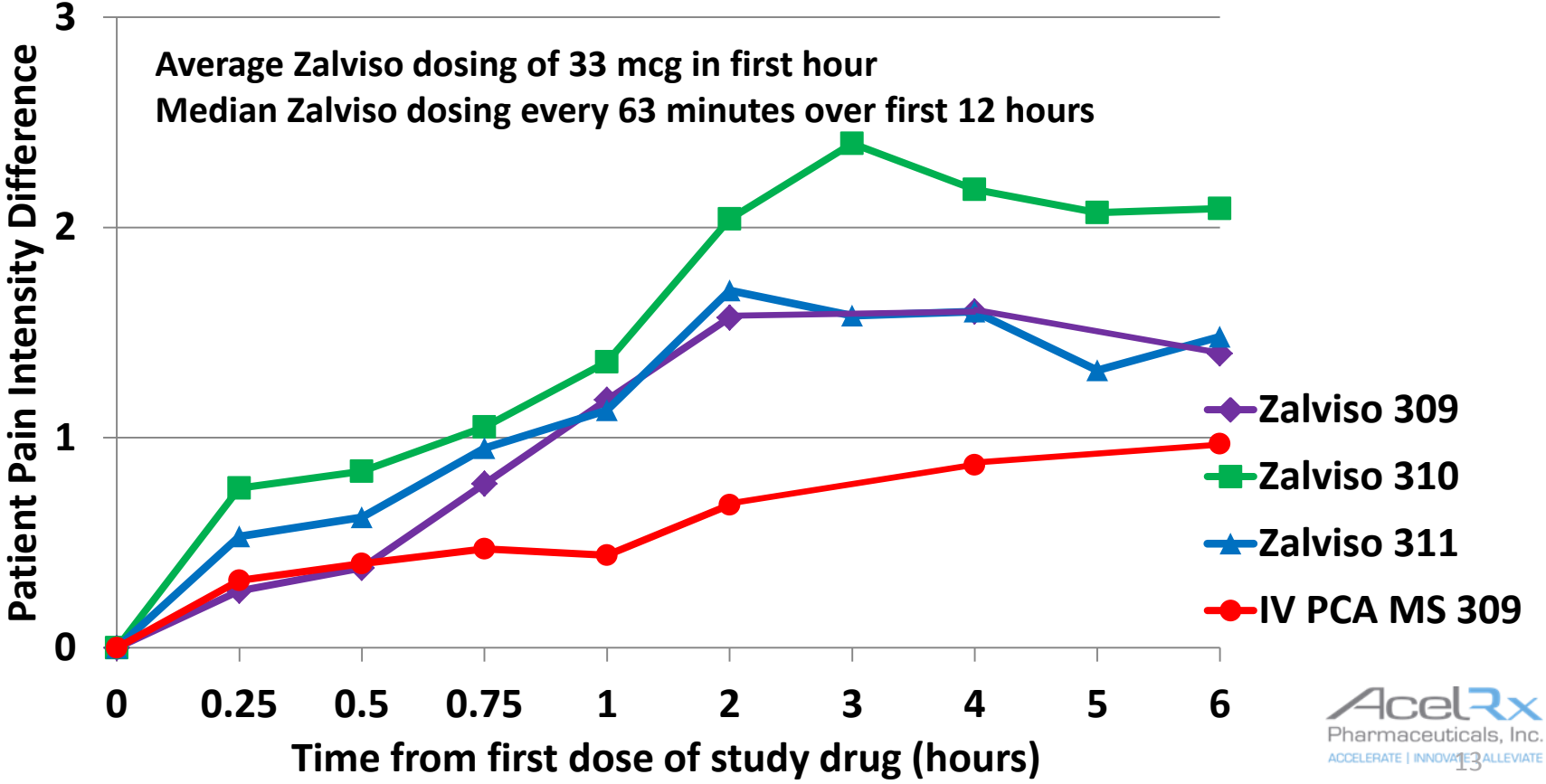
Patient and Nurse Ease of Care

Patient Subscale	Zalviso (n=177)	IV PCA MS (n=180)	P Value
Confidence with Device	4.69	4.51	0.015
Comfort with Device	4.47	4.33	0.041
Impact on Movement	4.73	3.88	<0.001
Dosing Confidence	4.74	4.47	0.003
Pain Control	3.58	3.16	0.004
Knowledge & Understanding	4.47	4.05	<0.001

Nurse Subscale	Zalviso (n=43)	IV PCA MS (n=41)	P Value
Bothersome	0.54	1.09	0.006
Time-Consuming	0.92	1.24	0.076

Zalviso: Rapid Control of Pain

Across all Phase 3 Studies



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Adverse Reactions >2% in Placebo Studies

Possibly or Probably Related Adverse Reactions	Zalviso N=429	Placebo N=162
Nausea	29.4%	22.4%
Vomiting	8.9%	4.9%
Oxygen Saturation Decreased	6.1%	2.5%
Itching*	4.7%	0%
Dizziness	4.4%	1.2%
Constipation	3.7%	0.6%
Headache	3.3%	3.7%
Insomnia	3.3%	1.9%
Hypotension	3.0%	1.2%
Confusional State	2.1%	0.6%

* Significantly Different between Zalviso and Placebo ($p<0.05$)

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Zalviso™
(sufentanil sublingual microtablet system)

Large Commercial Opportunity

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Moderate-to-Severe Pain in US Hospital Settings[1,2]

Hospital in-patient, moderate-to-severe acute pain, post-operative

- 12M procedures per annum, Zalviso potentially usable in ~95% cases

Hospital in-patient, moderate-to-severe acute pain, not post-operative

- 7.4M patients per annum, Zalviso potentially usable in ~66-80% cases
- IV push opioid is current standard for acute non-post-op pain, not IV PCA
- Physicians reported Zalviso may be supplementary to IV push

Hospital affiliated hospice, moderate-to-severe acute pain

- 300k patients per annum, Zalviso potentially usable in ~40% cases
- Zalviso is a potential replacement for liquid morphine

1. Rosetta Mini-quant Survey fielded to 29 physicians (15 hospitalists and 14 anesthesiologists) in Winter 2011.
2. Rosetta Qualitative Interviews, Fall 2011.

Formulary Adoption after FDA Approval Based on Clinical Data

Earliest – 2 Months; Typical – 8-10 Months

42% Very Likely to Approve

- convinced by the clinical benefit demonstrated
- assume ability to demonstrate economic benefit or set cost aside

42% Quite Likely to Approve

- looking for relevant experts to champion the product
- unsure of cost, looking for favorable cost-benefit analysis

16% Early Approval Unlikely

- might be swayed by additional, independent clinical literature
- assume product expensive, might accept favorable cost-benefit analysis

ZS Associates Qualitative Survey Among 45 P&T Committee Members, Fall 2013.

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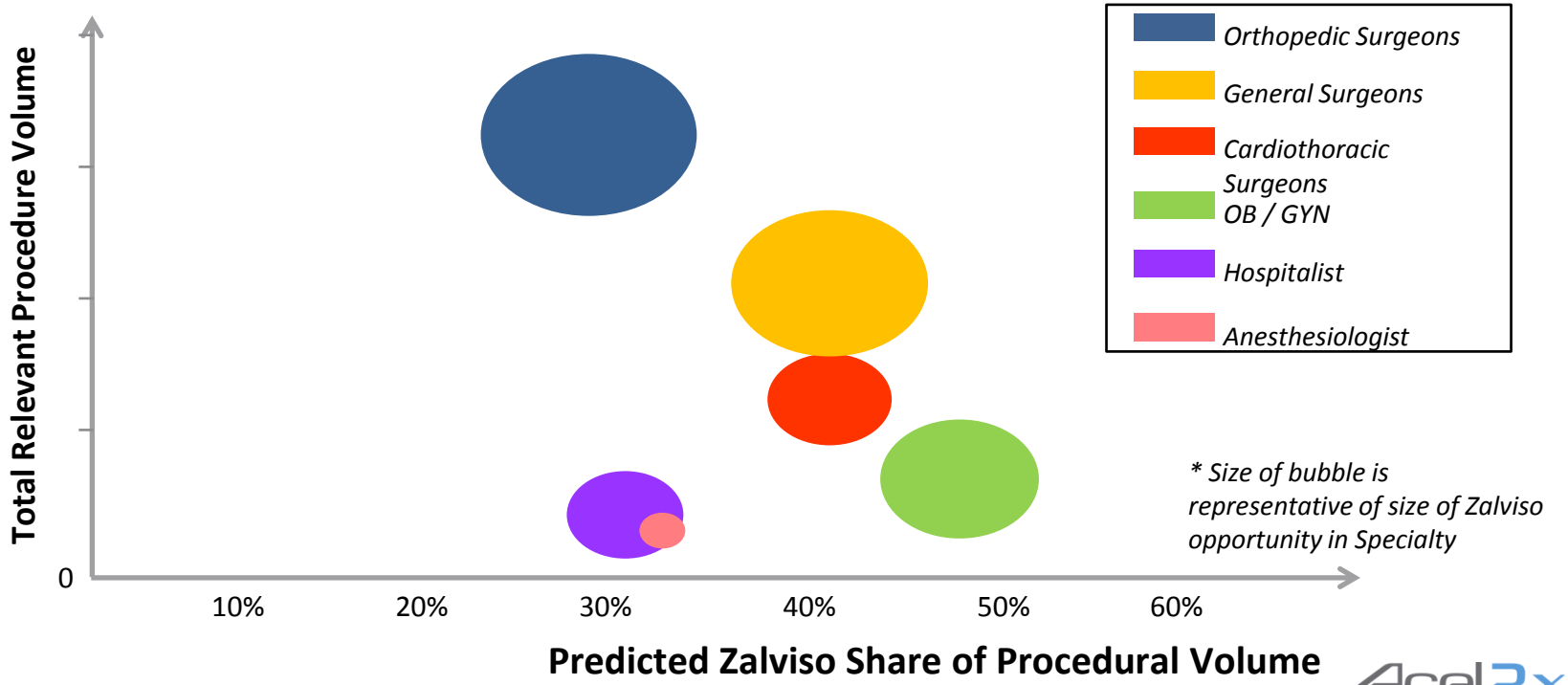
Strong Positive Reaction to Zalviso Clinical Profile
Market Research Among Hospital Specialists (n=244)[1]



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Adoption will Depend on Individual Surgeon Profile

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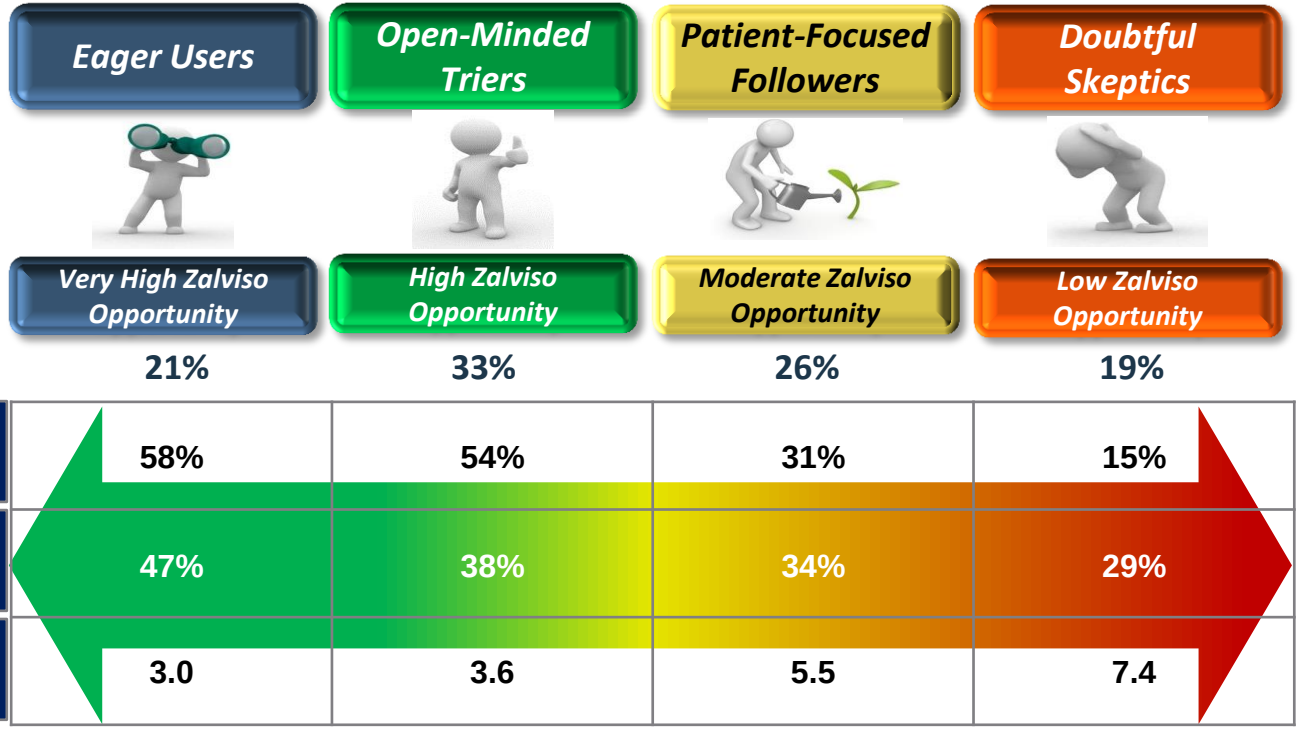

*** Percentage who rate Zalviso a 6 or 7 on a 1-7 scale**

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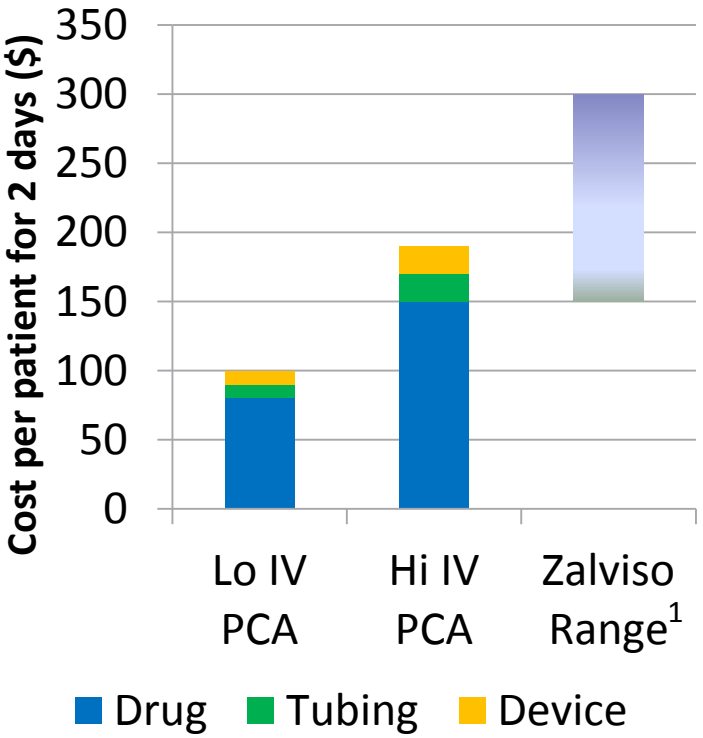
Pricing and Pharmacoeconomics



Option to price in line with IV PCA

- Margins on disposable elements allow pricing flexibility
- Pharmacoeconomic model will illustrate value to hospital

Pharmacoeconomic value created by:

- Elimination of programming errors
- Elimination of PCA IV site infection risk
- Earlier and easier ambulation potentially accelerates hospital release
- Early onset of pain relief should lower opioid dosing, less overshoot
- Enhanced Patient Satisfaction results in improved CMS reimbursement

1. Results from 27 P&T committee member interviews conducted by BioMedEcon, 2010

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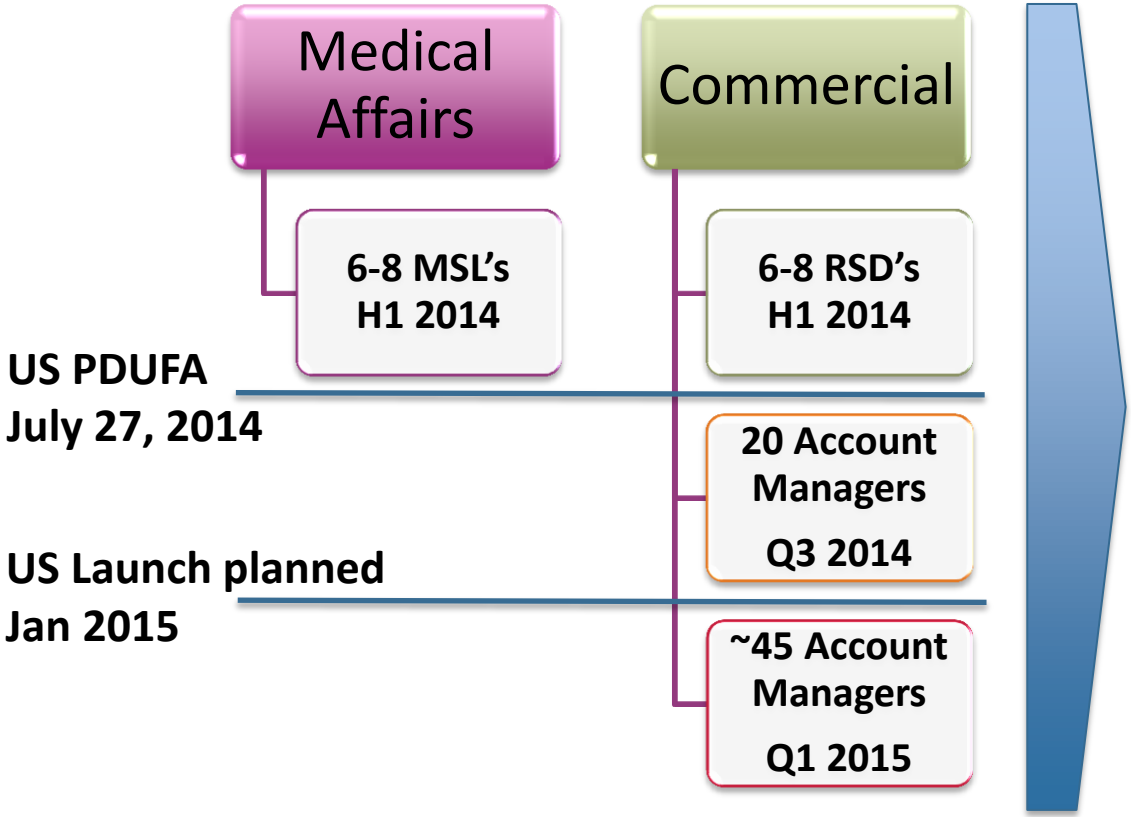
US Customer-focused Organization Build



80% of relevant procedure volume is found in the top **1,400** accounts

65 sales reps estimated to cover customer group

Estimated cost/rep $250K

Estimated salesforce cost around $16.5M per annum

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ARX-04
HCP Administered
Single 30mcg dose
Sufentanil NanoTab

Moderate to severe acute pain treatment in medically supervised settings

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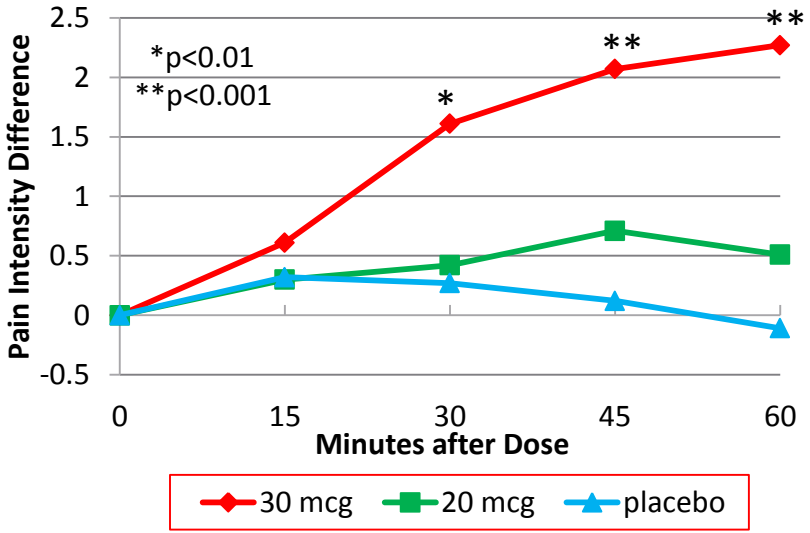
Investigational drug and delivery system not FDA approved for commercial use

ARX-04 – Short Term Acute Pain Management

Phase 2

30mcg sufentanil NanoTab rapid onset of effect demonstrated



End of Phase 2 Meeting held Dec. '13

- 505(b)(2) submission
- 500 patient safety database requested, 100 multiple dose, 400 single dose
- Single Phase 3 placebo controlled study
  - Abdominal surgery, SPID-12 primary, follow for 48 hours
  - FPI in H2 2014
  - Results expected in H2 2015
- Single & repeat dose pk study

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ARX-04 – Commercial Opportunity

Peri-Hospital ARX-04 Market Opportunity Complements Zalviso

- ER Department
  - 130M visits annually, analgesics provided in 95M of these visits
  - Stomach Pain and Chest Pain two most common reasons to attend ER
- Ambulatory Surgery Center
  - 35M ASC visits per year
  - 1-6 hour recovery in ASC typical after procedure
- Paramedics
  - 15M patients transported/yr
  - 20% in moderate to severe pain

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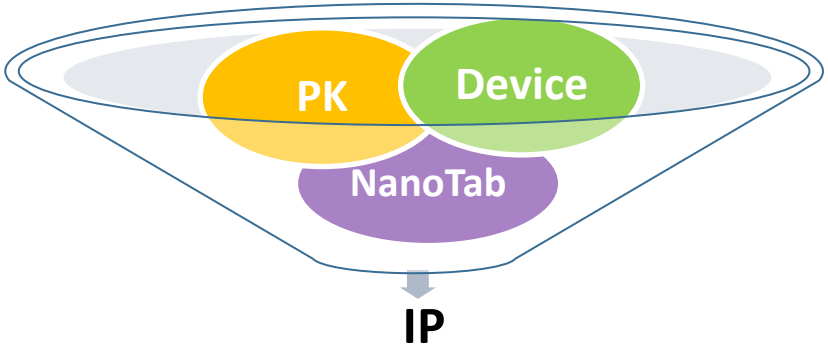
Broad Patent Strategy & Estate

Strategy

Drug-device combination allows overlapping & interlocking patents



Integrated IP and regulatory strategy designed to minimize ANDA exposure

Estate

6 US patents issued on NanoTab
4 US patents issued on Devices
- Coverage through 2027 - 2031

2 EU patents issued on NanoTab
1 EU Patent issued on Device
- Coverage through 2027 - 2029

7 issued patents in other territories

13 US applications plus 40 foreign and PCT applications in late stage prosecution

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Financial Summary

Cash position at March 31, 2014: $92.9 million

- Option to draw up to $25 million in 2 tranches from debt facility
  - $10 million available through 2Q 2014
  - $15 million contingent on Zalviso approval, available through 1Q 2015

Currently available cash resources fund operations through breakeven

- Assumes timely regulatory approval of Zalviso in the US
- Supports execution of all planned US commercial launch efforts for Zalviso
- Provides ability to fund Phase 3 development of ARX-04 through NDA

Net 1Q 2014 cash usage of $10.8 million

43.1 million shares outstanding at March 31, 2014

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