



Software for
Business Intelligence

BizInt Smart Charts

Patents & IP Sequences | Clinical Trials | Drug Pipelines

Challenges in Visualizing Pharmaceutical Information - Smart Strategy Dashboards

IC-SDV 2018, Nice

Diane Q. Webb, President

23 April 2018

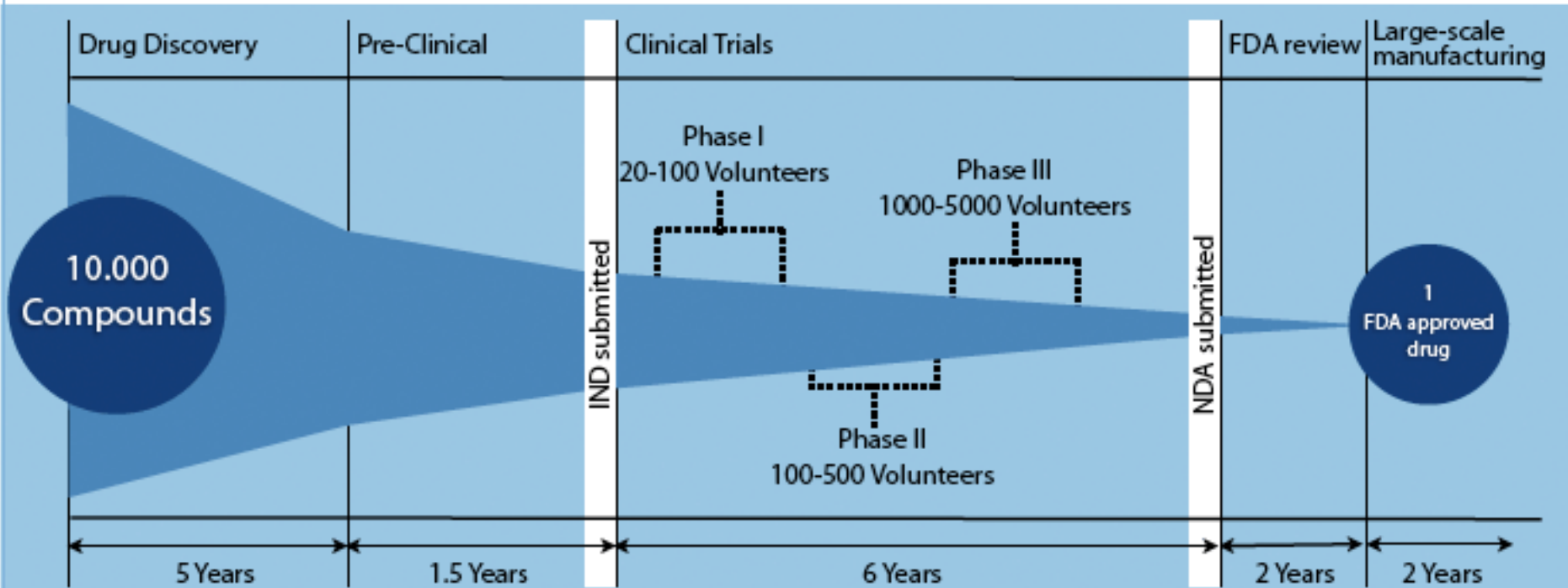
www.bizint.com

2013 II-SDV Paper: *Challenges in Visualizing Pharmaceutical Business Information*

The Problem:

Visualizations developed for scientific and patent data do not do a good job of “telling the story” when applied to drug pipeline data and often need significant changes.

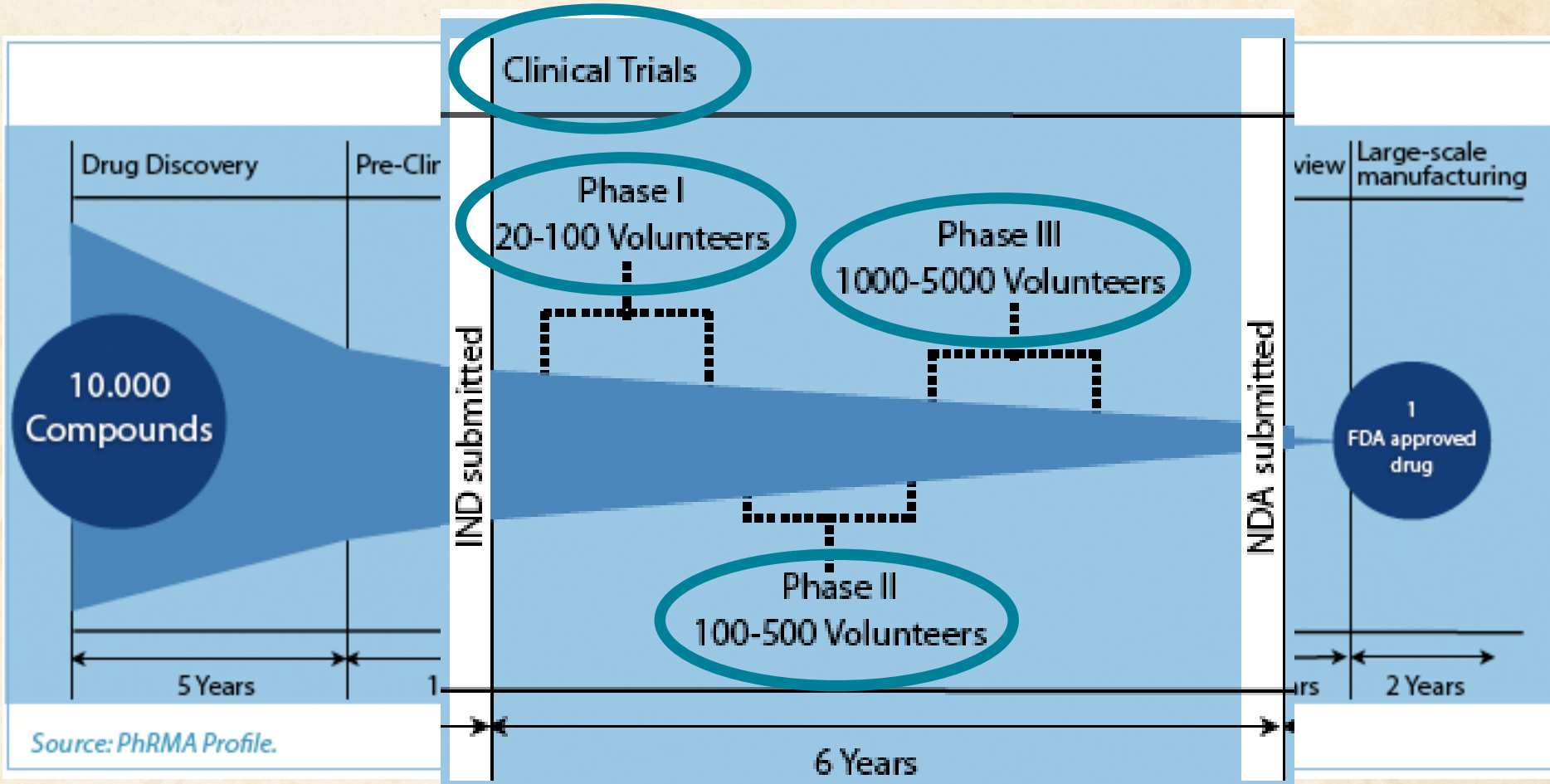
The Drug Development "Pipeline"



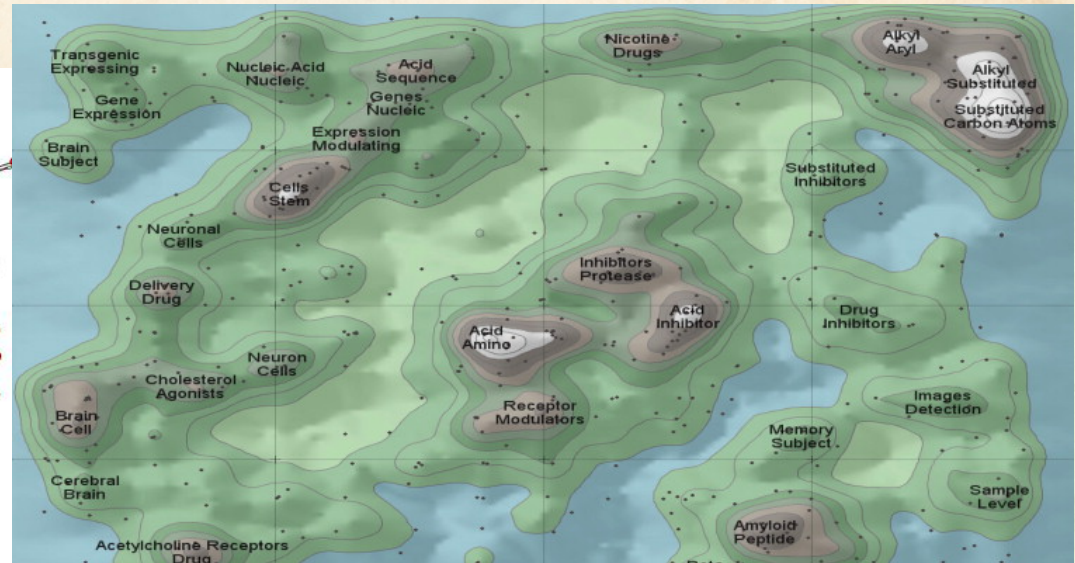
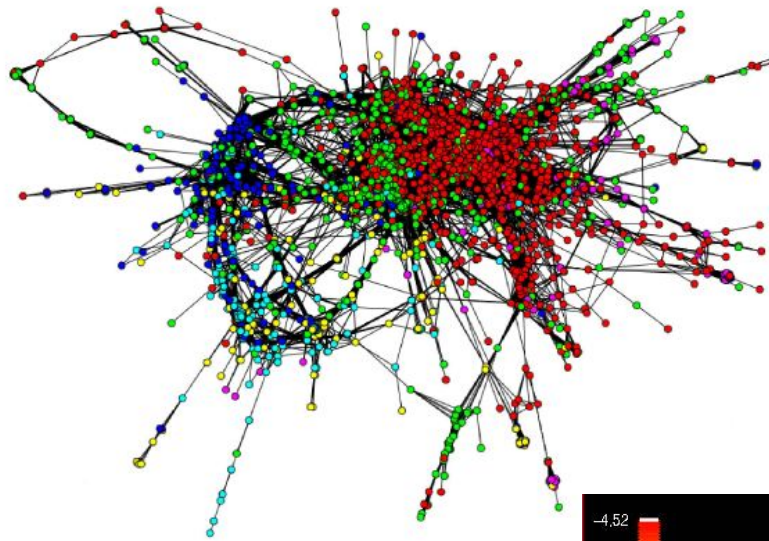
Source: PhRMA Profile.

At each stage of the pipeline, companies need information on drugs in development to make both business and research decisions.

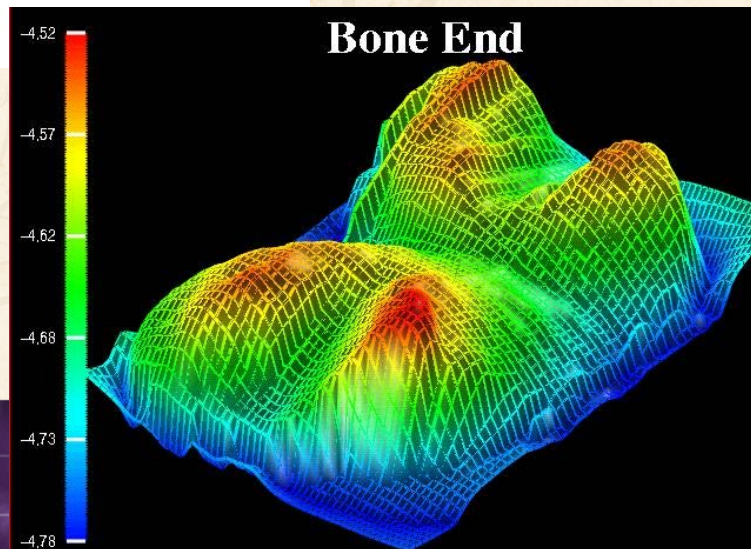
Clinical Trials Phases in the Drug Pipeline



Examples of Technical Visualizations

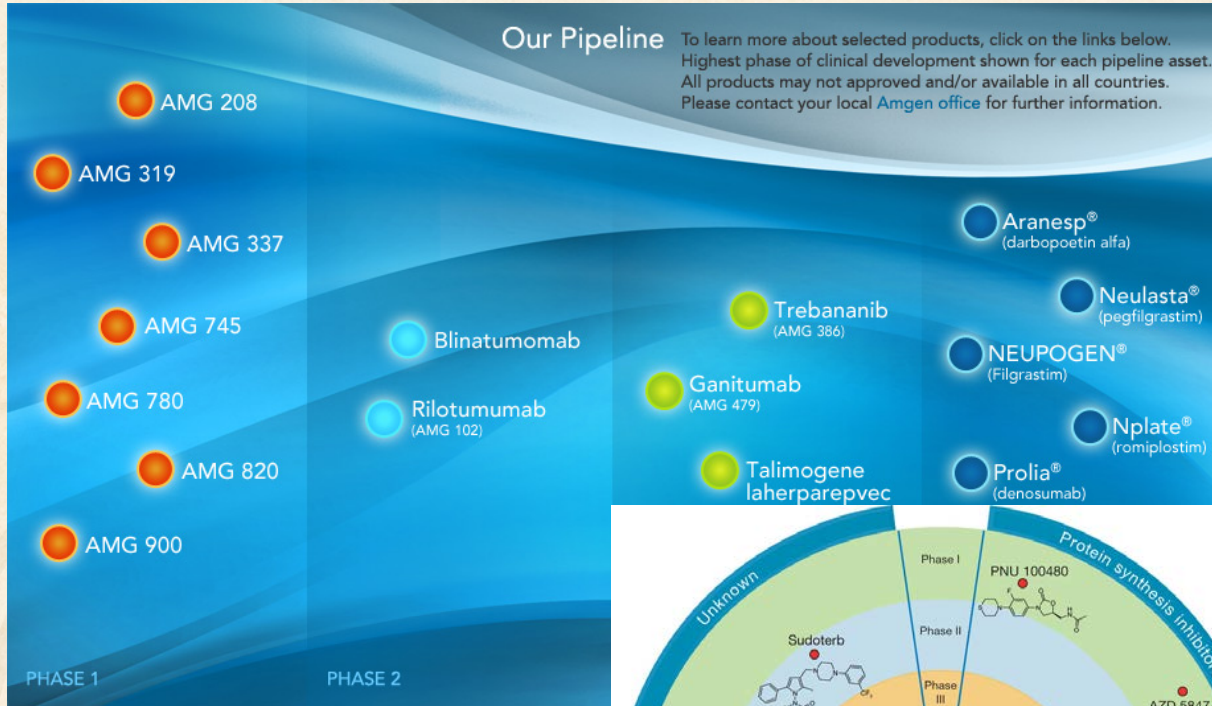


Found on the web

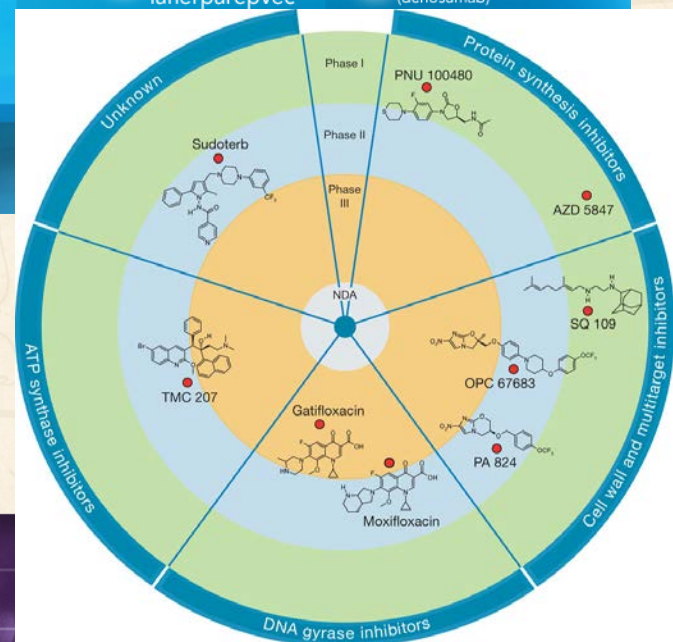


Source: Edi et al., Yang et al, Search Technology

Examples of pharma pipeline visualizations



| EXPLORATORY | CONFIRMATORY | | REGISTRATION |
|--------------------------------------|---|---|---|
| | PHASE II | PHASE III | |
| HCD122 Hem. tumors | LBQ707 Solid Tumors | EPO906 Ovarian cancer | Tasigna® (JPN) IM7 res. / intoLCLM ³ |
| TKI258 Hem./solid tumors | PKC412 AML ¹ | SOM230 Acromegaly / Cushing's disease | Exjade® (JPN) Chronic iron overload |
| RAF265 Melanoma | LBH589 Hemat. tumors | Glivec® GIST ² adjuvant / CML ³ | <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: #e67e22; margin-right: 5px;"></div> NME⁹ <div style="width: 15px; height: 15px; background-color: #8e44ad; margin-right: 5px; margin-left: 5px;"></div> NME⁹ roll-out <div style="width: 15px; height: 15px; background-color: #f1c40f; margin-right: 5px; margin-left: 5px;"></div> LCM¹⁰ </div> |
| LBY135 Solid tumors | ASA404 Solid tumors | RAD001 Neuroend. tum. | |
| BEZ235 Solid tumors | RAD001 Sol. tumors / breast cancer/ PICT ⁹ | RAD001 RCC ⁴ | |
| AUY922 Solid tumors | SOM230 GEP ¹¹ tumors | Tasigna® GIST ² / newly diagnosed CML ³ / subop. CML ³ | |
| BHQ880 Solid tumors | Glivec® Non-oncology indications | | <ol style="list-style-type: none"> 1 Acute myeloid leukemia 2 Gastrointestinal stromal tumor 3 Chronic myeloid leukemia 4 Renal cell carcinoma 6 Pancreatic islet cell tumor 7 Imatinib 8 Hereditary hemochromatosis 9 New molecular entity 10 Life cycle management 11 Gastroenteropancreatic |
| BGT226 Solid tumors | EPO906 Solid tumors | | |
| LBH589 Hem. & solid tumors | | | |
| Exjade® HH ⁸ | | | |
| | | | |



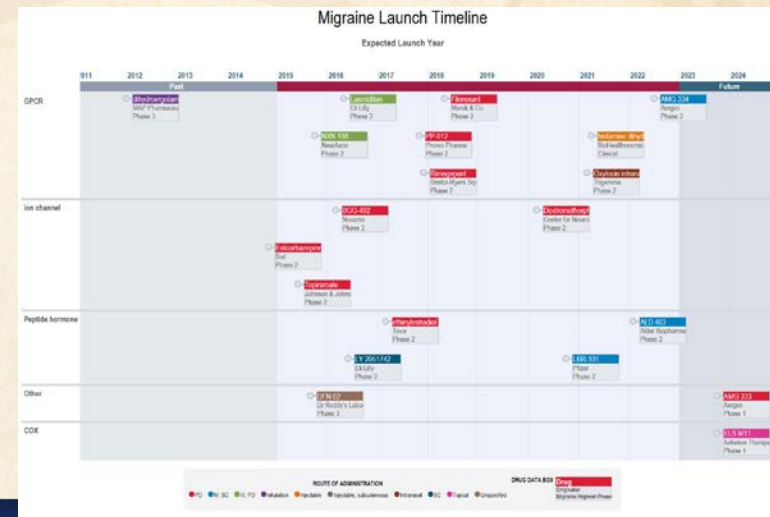
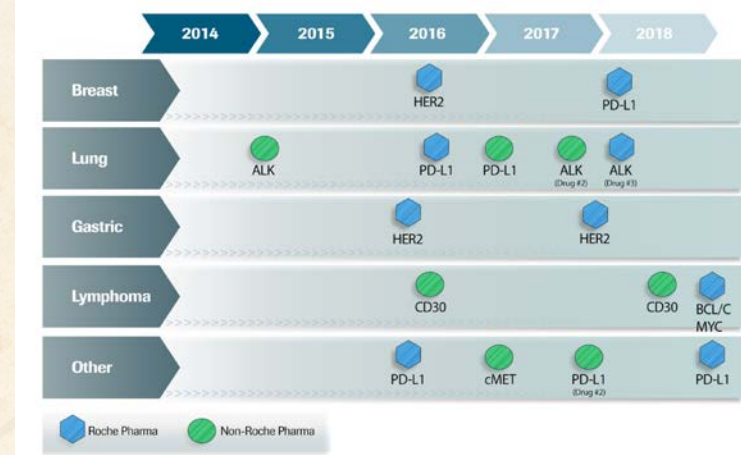
Found on the web

Source: Roche, Liquid AmgenOncology websites

2016 II-SDV Paper: *Competitive Launch Landscapes*

- Worked with a customer to automate the creation of labor intensive, hand-drawn product launch timelines.
- Result: Attractive computer-drawn visualizations...
- That required a lot of **data preparation** to create.

More info: bizint.com/slides



Lessons Learned - You need a team

- **Decision maker** who needs the visualization.
- **Competitive intelligence analyst** who knows the disease area and company interests.
- **Search specialist** to collect the correct data.
- **Sophisticated tool user** who can manipulate the data.
- *In some companies, it can be hard to assemble these skills.*



BizInt Smart Strategy Dashboards (BizDash)



BizDash BizInt Smart Strategy Dashboards

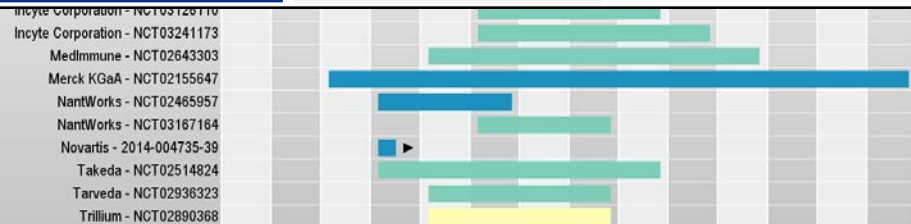
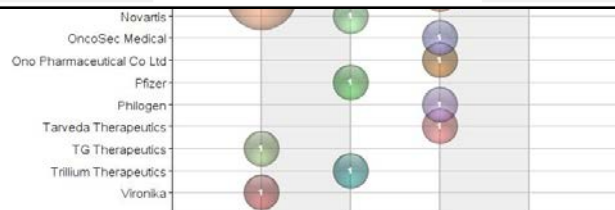
- Designed for analysts who don't have the time to learn some or all of the BizInt tools.
- BizInt will use the BizInt Smart Charts tools to build BizInt Smart Strategy Dashboards for you.
- Smart Strategy Dashboards is a set of visualizations that address several questions about your topic: Who? What? Where? When?



| Clinical Phase Unknown | Phase I | Phase I/II | Phase II | Phase III | Phase IV |
|---|--|---|---|--|--|
| NCT03089658 Merck KGaA/Pfizer | NCT02035657 Immune Design | NCT03167164 NantWorks | NCT02054884 Phlogen | 2010-023827-34 POLICLINICO UNIVERSITARIO AGOSTINO GEMELLI | 2005-000402-32 Genetronics Biomedical Corporation |
| NCT02471352 National Cancer Institute | NCT02831179 National Cancer Institute | NCT03241173 Incyte Corporation | NCT02978625 National Cancer Institute | | NCT01794793 Novartis |
| NCT03210935 University Hospital, Lille | NCT03212404 Checkpoint Therapeutics | NCT02488759 BMS | 2011-003226-27 GSK | | |
| NCT00540566 University of California, Irvine | NCT02890368 Trillium | NCT02514824 Millennium | 2014-004735-39 Novartis | | |
| NCT00765193 Medical University of Graz | NCT03000257 AbbVie | NCT02584829 Fred Hutchinson Cancer Research Center | 2016-000461-23 BMS | | |
| NCT01526486 Emory University | NCT03071757 AbbVie | NCT02643303 MedImmune | NCT02155647 Merck KGaA | | |
| | NCT03107663 ImaginAb | NCT02936323 Tarveda | NCT02196961 BMS | | |
| | NCT00655655 National Cancer Institute | NCT03126110 Incyte Corporation | NCT02351128 University Hospital, Grenoble | | |
| | NCT00346385 ImmunoGen | NCT01758458 Fred Hutchinson Cancer Research Center | NCT02465957 NantWorks | | |
| | NCT01155258 Pfizer | | NCT02819843 Amgen | | |
| | NCT01204476 National Cancer Institute | | NCT03071406 BMS | | |
| | NCT01652547 Novartis | | NCT01013779 Trans-Tasman Radiation Oncology Group (TROG) | | |
| | NCT00002947 National Cancer Institute | | NCT02036476 Exelixis | | |
| | | | NCT02267603 National Cancer Institute | | |
| | | | NCT00003549 National Cancer Institute | | |
| | | | NCT00004922 National Cancer Institute | | |
| | | | NCT00068783 National Cancer Institute | | |
| | | | NCT00079131 National Cancer Institute | | |
| | | | NCT00869050 Columbia University | | |
| | | | NCT01440816 OncoSec Medical Incorporated | | |
| | | | NCT00003514 Burzynski Research Institute | | |
| | | | NCT01913691 National Cancer Institute | | |

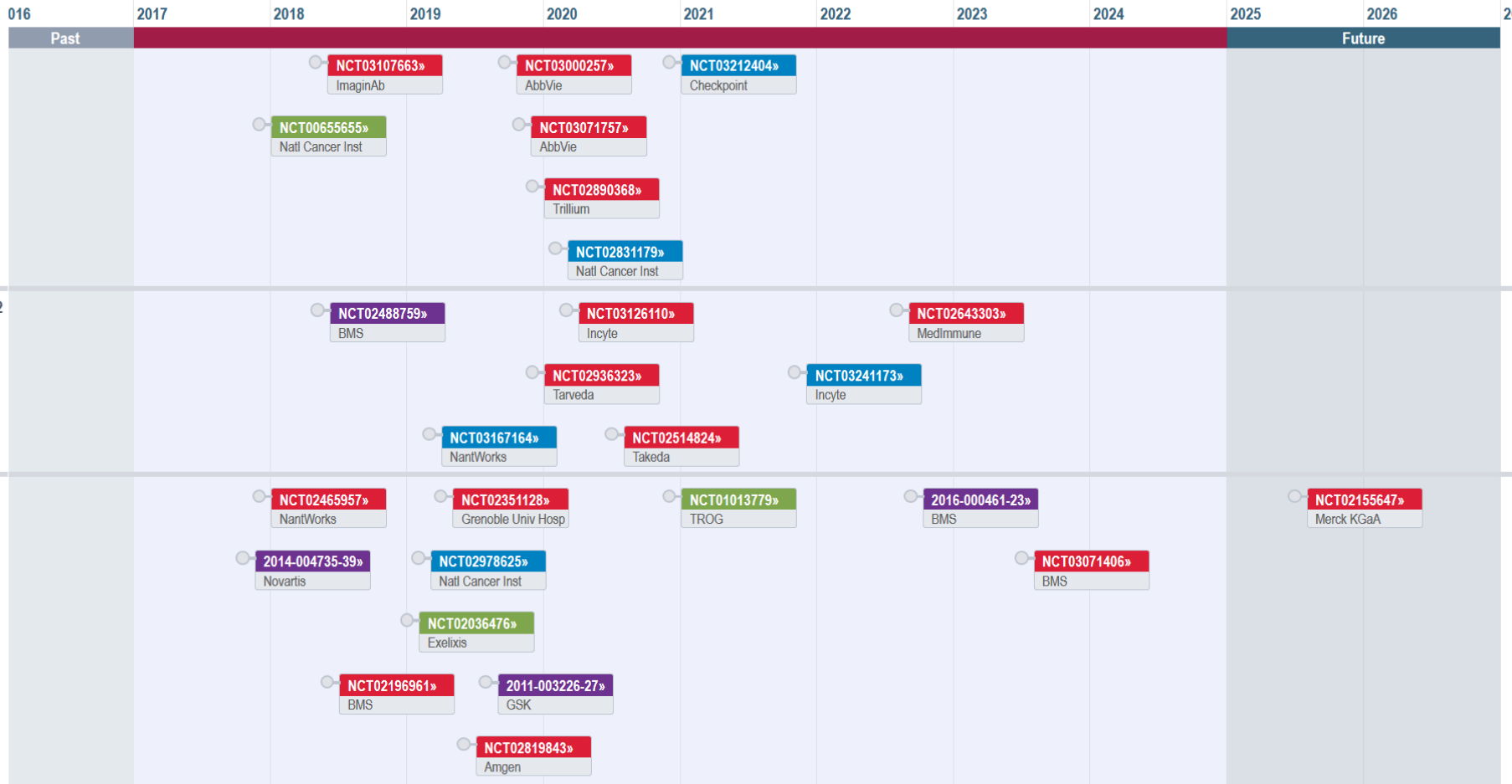
Overall Status

- Unknown status
- Available
- Planned
- Ongoing
- Open, Recruiting
- Active, Not Recruiting
- Completed
- Terminated



Phase I Phase I/II Phase II Unknown end

Expected Trial Completion



OVERALL STATUS
● Planned ● Ongoing ● Open, Recruiting ● Active, Not Recruiting

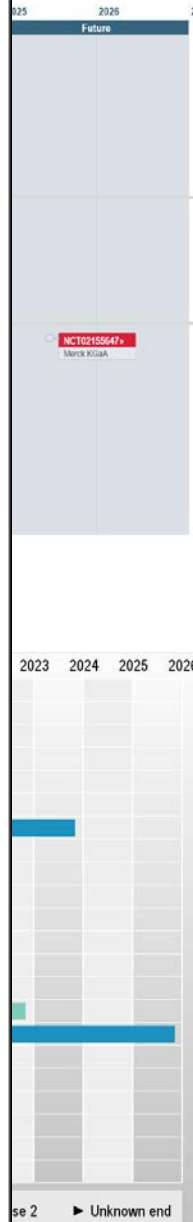
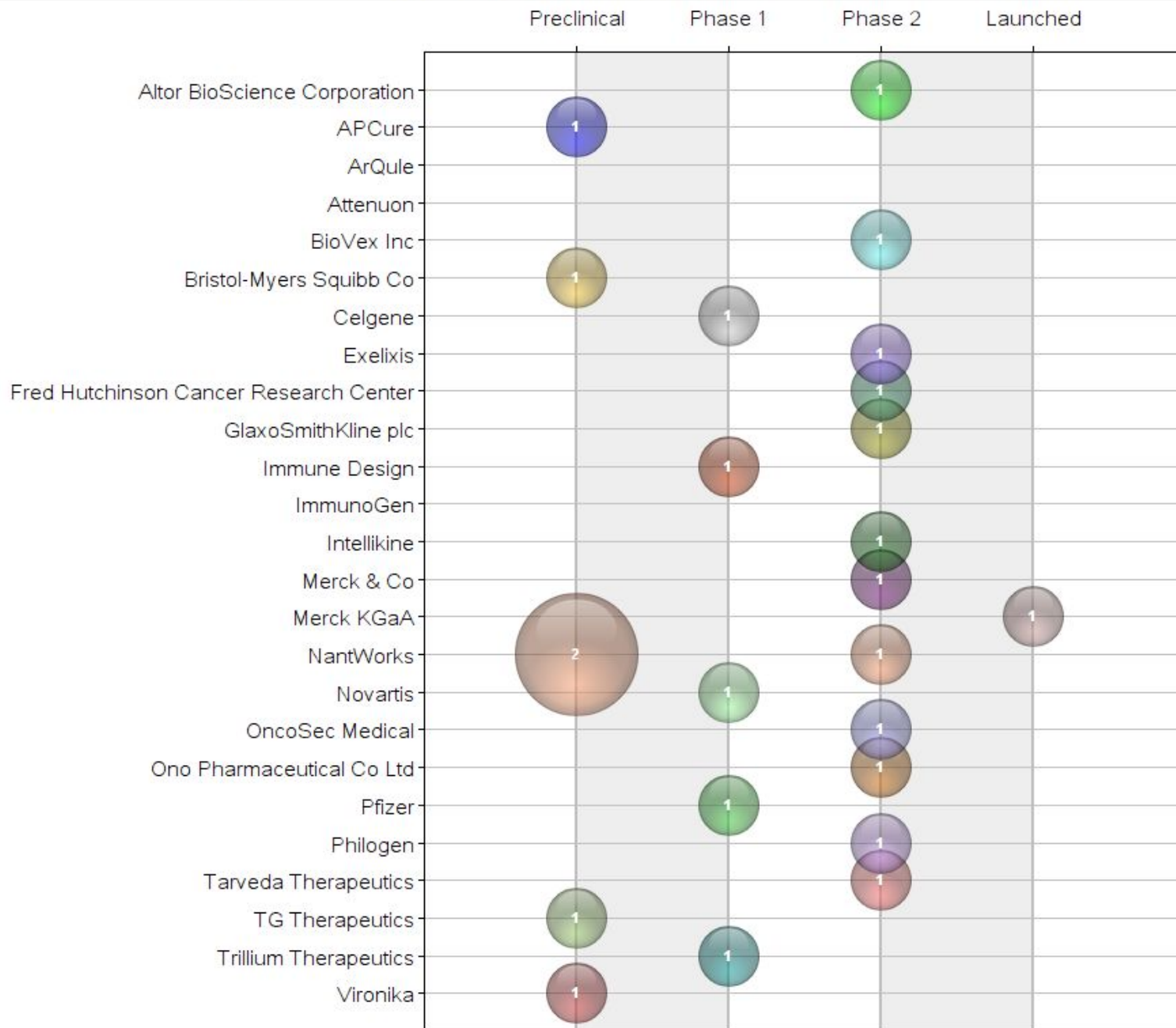
DRUG DATA BOX
Trial ID»
 Sponsor

Trillium Therapeutics
Vironika

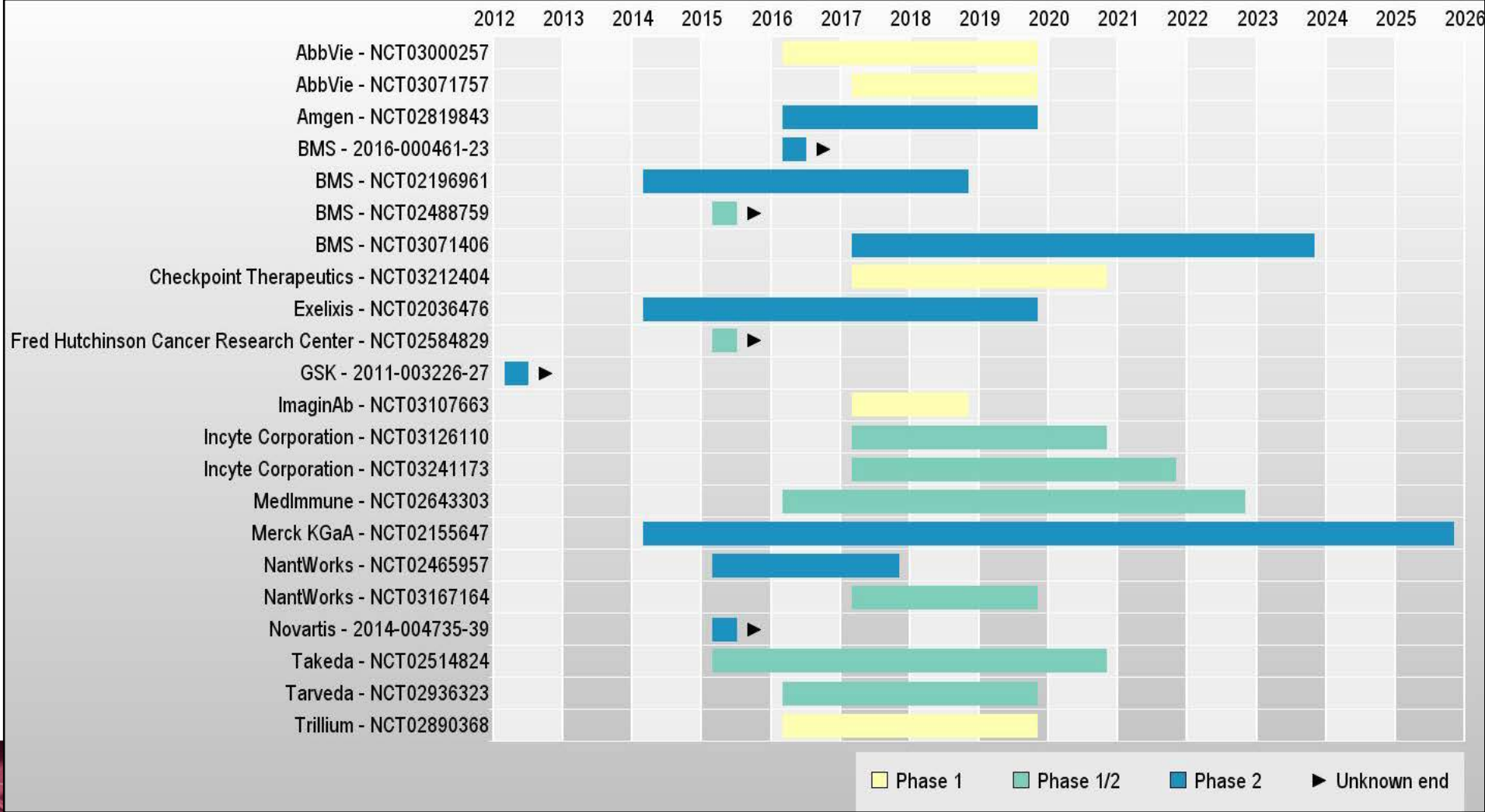
Takeda - NCT02514824
 Tarveda - NCT02936323
 Trillium - NCT02890368

Phase 1 Phase 1/2 Phase 2 Unknown end

Drugs for MCC by Company and highest indication phase



| Phase I | Phase I/II | Phase II | Phase III |
|--------------------------|--------------------------|--------------------------|--------------------------|
| NCT02001477 Immunogen | NCT01467844 Immunogen | NCT02001481 Immunogen | NCT02001482 Immunogen |
| NCT02001478 Immunogen | NCT02001479 Immunogen | NCT02001480 Immunogen | NCT02001481 Immunogen |
| NCT02001479 Immunogen | NCT02001480 Immunogen | NCT02001481 Immunogen | NCT02001482 Immunogen |
| NCT02001480 Immunogen | NCT02001481 Immunogen | NCT02001482 Immunogen | NCT02001483 Immunogen |
| NCT02001481 Immunogen | NCT02001482 Immunogen | NCT02001483 Immunogen | NCT02001484 Immunogen |
| NCT02001482 Immunogen | NCT02001483 Immunogen | NCT02001484 Immunogen | NCT02001485 Immunogen |
| NCT02001483 Immunogen | NCT02001484 Immunogen | NCT02001485 Immunogen | NCT02001486 Immunogen |
| NCT02001484 Immunogen | NCT02001485 Immunogen | NCT02001486 Immunogen | NCT02001487 Immunogen |
| NCT02001485 Immunogen | NCT02001486 Immunogen | NCT02001487 Immunogen | NCT02001488 Immunogen |
| NCT02001486 Immunogen | NCT02001487 Immunogen | NCT02001488 Immunogen | NCT02001489 Immunogen |
| NCT02001487 Immunogen | NCT02001488 Immunogen | NCT02001489 Immunogen | NCT02001490 Immunogen |
| NCT02001488 Immunogen | NCT02001489 Immunogen | NCT02001490 Immunogen | NCT02001491 Immunogen |
| NCT02001489 Immunogen | NCT02001490 Immunogen | NCT02001491 Immunogen | NCT02001492 Immunogen |
| NCT02001490 Immunogen | NCT02001491 Immunogen | NCT02001492 Immunogen | NCT02001493 Immunogen |



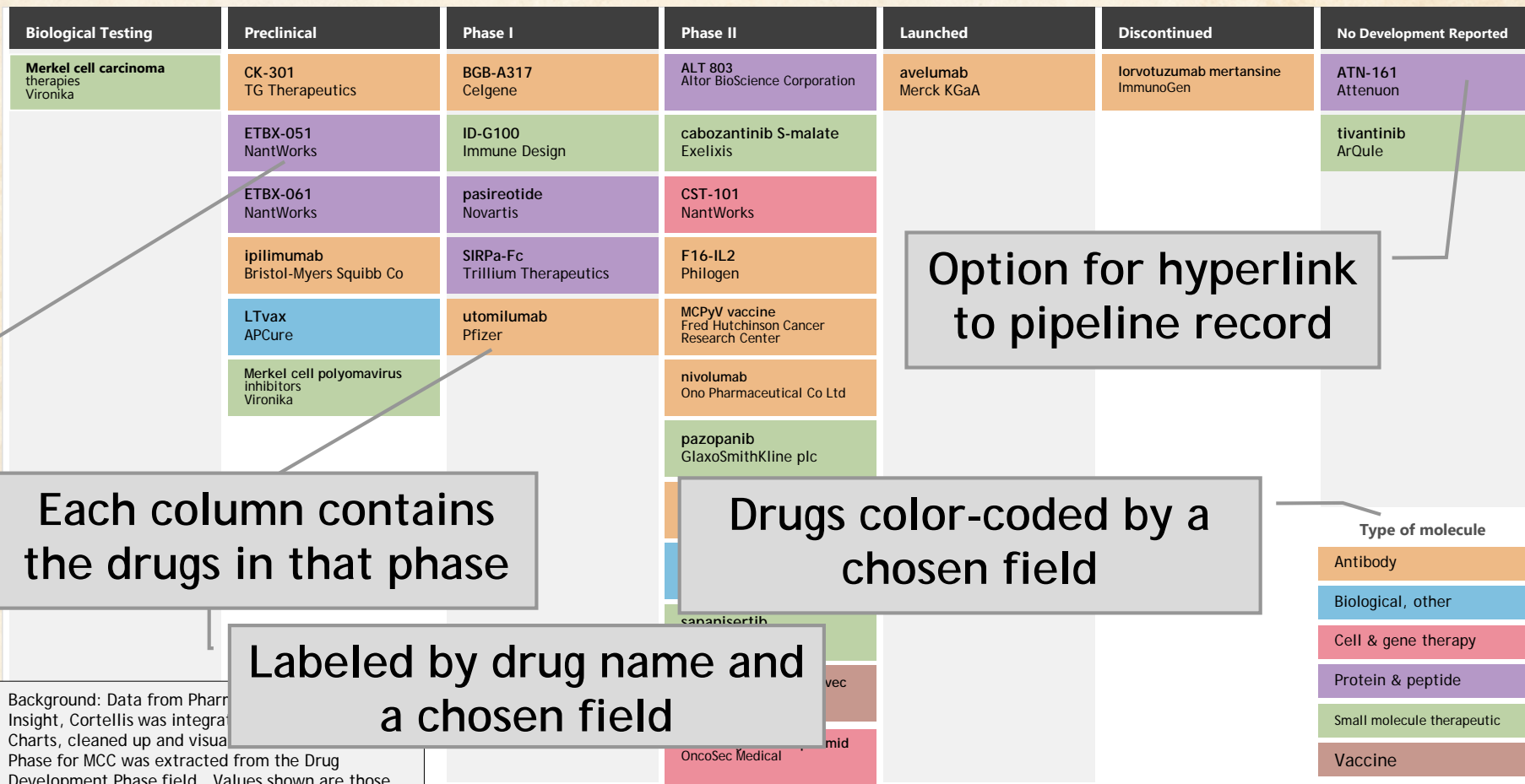
Lessons Learned - It's all about



- There is some interest in an interactive visualization that people can explore...
- But the primary requirement is for a **PowerPoint slide**.
- An image in a PowerPoint slide is okay...
- But you'd really like to create PowerPoint objects (so you can customize the presentation and make final edits.)

"Piano Chart" - PowerPoint visualization

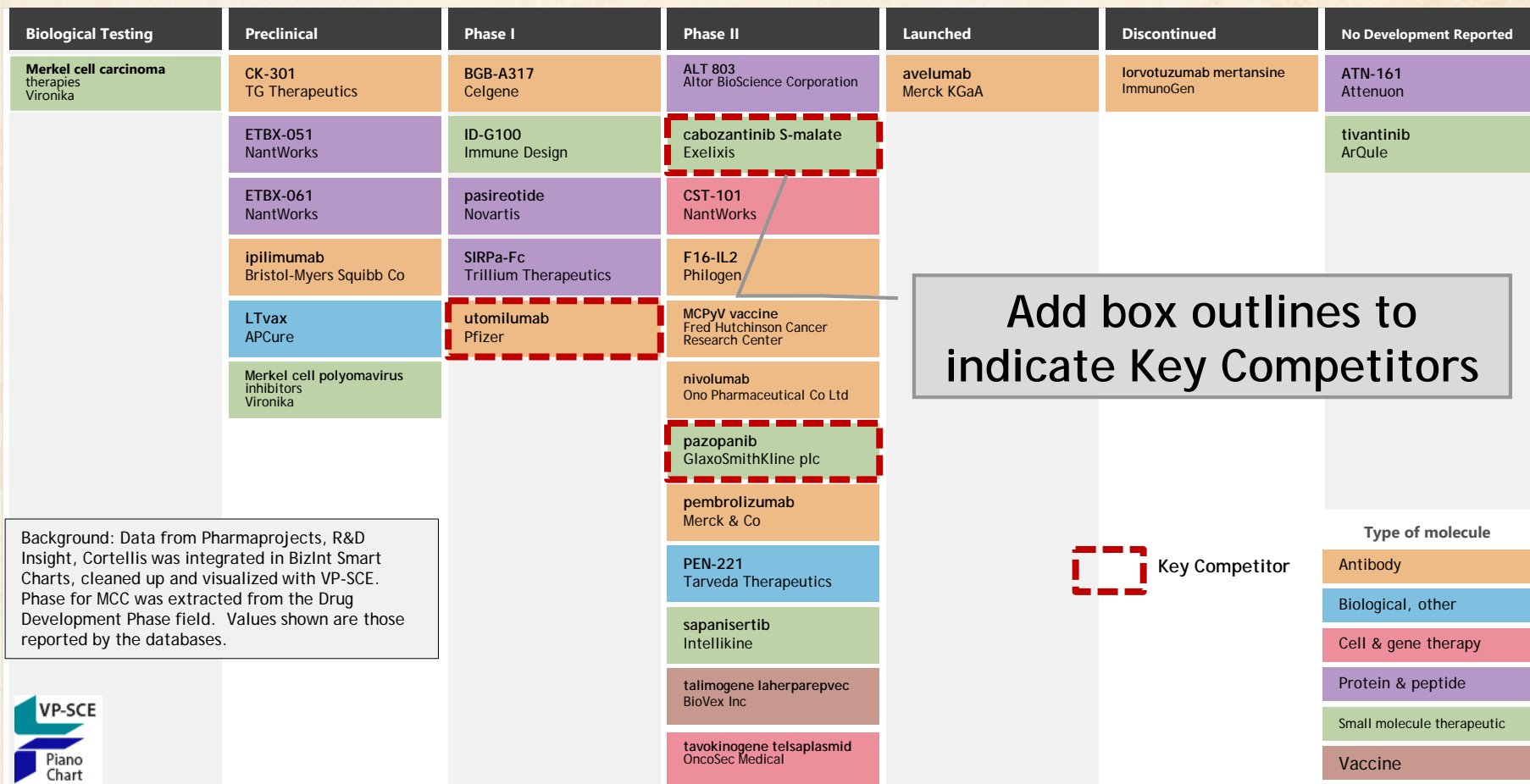
Merkel cell carcinoma (MCC) pipeline: Phase for MCC and type of molecule



Background: Data from Pharr Insight, Cortellis was integrated into Charts, cleaned up and visualized. Phase for MCC was extracted from the Drug Development Phase field. Values shown are those reported by the databases.

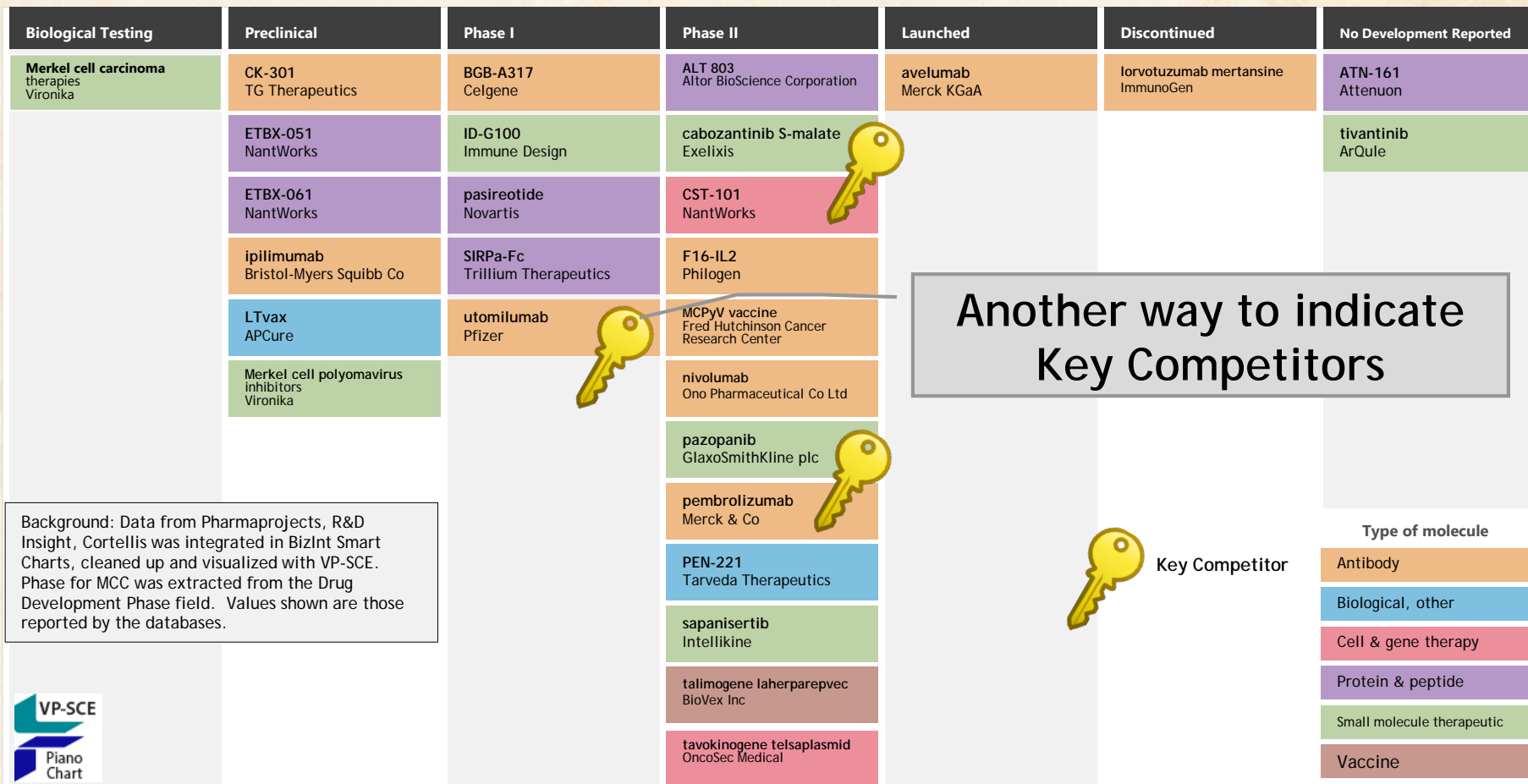
Annotating the Piano Chart in PowerPoint

Merkel cell carcinoma (MCC) pipeline: Phase for MCC and type of molecule



Annotating the Piano Chart in PowerPoint

Merkel cell carcinoma (MCC) pipeline: Phase for MCC and type of molecule

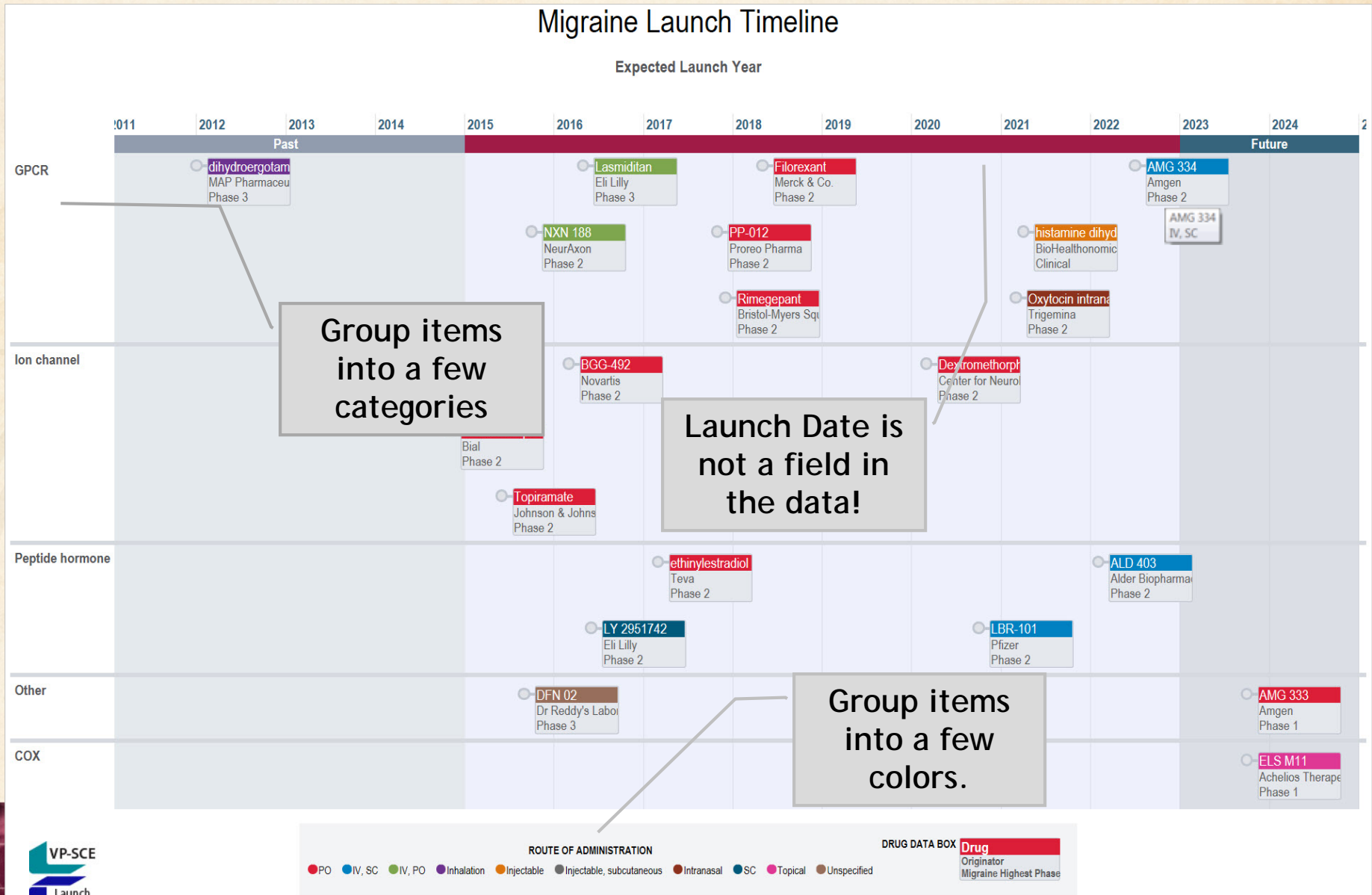


Lessons Learned - It's not "Easy"



- Everyone wants an "easy" button!
- We've made the actual drawing of the visualizations easy.
- But a lot of data preparation is necessary --
 - Filter data to the most critical items (e.g. "Key Drugs")
 - Group values to create useful categories.
 - Shorten labels to fit.
 - Apply expertise for values not in the data.

Data Preparation for the Launch Timeline



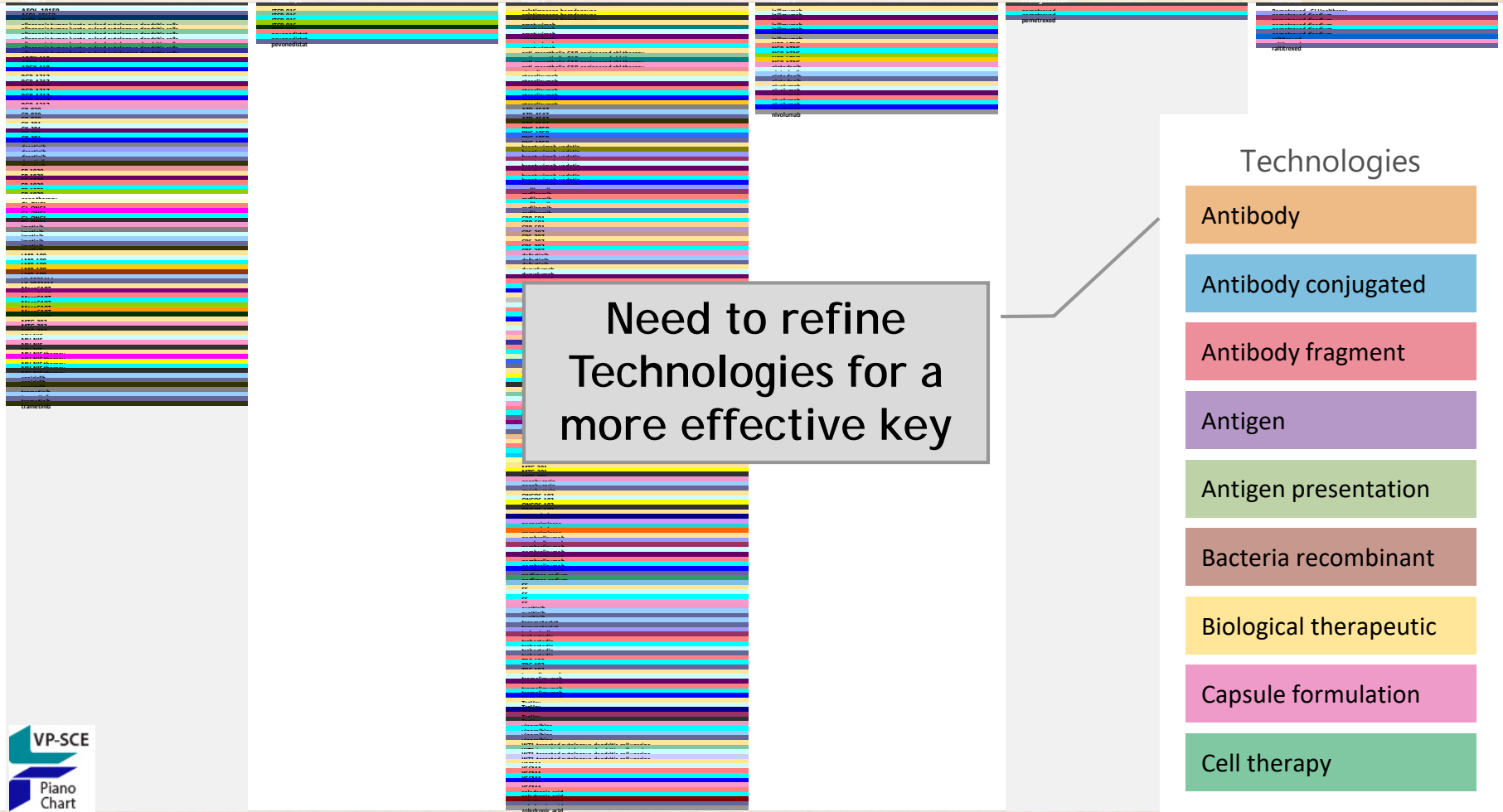
Piano Chart without data preparation

Piano Chart - Mesothelioma



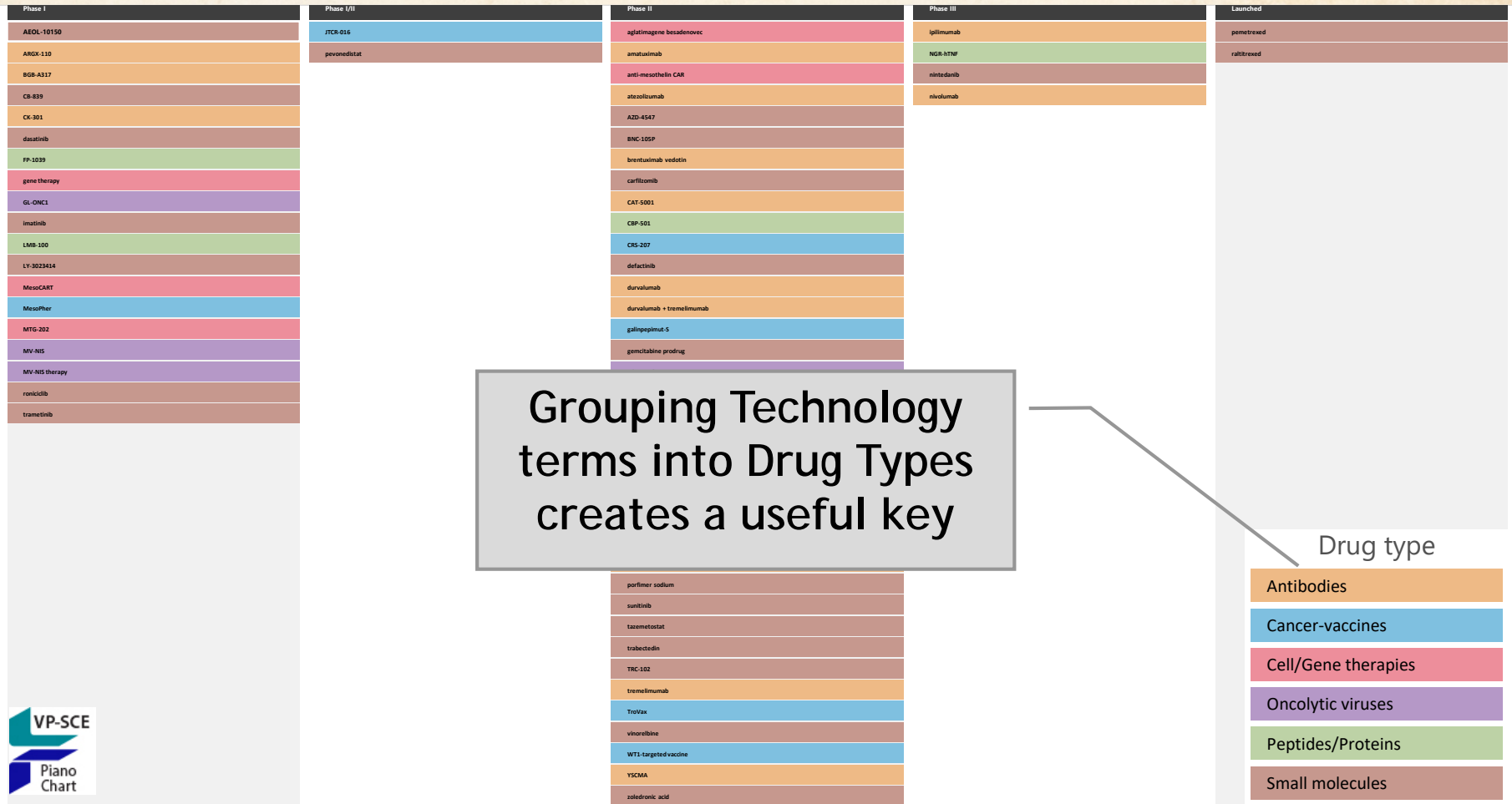
Piano Chart without data preparation

Piano Chart - Mesothelioma



Piano Chart - creating a useful color key

Piano Chart Mesothelioma



Piano Chart - how to display large columns

Piano Chart – Mesothelioma

| Phase 1 | Phase 1/2 | Phase 2 | Phase 2 | Phase 3 | Launched |
|----------------|--------------|---------------------|----------------------|------------|-------------|
| AEOL-10150 | JTCR-016 | aglatimagene | lurbinectedin | ipilimumab | pemetrexed |
| ARGX-110 | pevonedistat | amatuximab | Minerval | NGR-hTNF | raltitrexed |
| BGB-A317 | | anti-mesothelin CAR | miR-15/16 mimics | nintedanib | |
| CB-839 | | atezolizumab | MTG-201 | nivolumab | |
| CK-301 | | AZD-4547 | napabucasin | | |
| dasatinib | | BNC-105P | ONCOS-102 | | |
| FP-1039 | | brentuximab vedotin | pegargiminas | | |
| gene therapy | | carfilzomib | pembrolizumab | | |
| GL-ONC1 | | CAT-5001 | porfimer sodium | | |
| imatinib | | CBP-501 | sunitinib | | |
| LMB-100 | | CRS-207 | tazemetostat | | |
| LY-3023414 | | defactinib | trabectedin | | |
| MesoCART | | durvalumab | TRC-102 | | |
| MesoPher | | durvalumab + | tremelimumab | | |
| MTG-202 | | galinpepimut-S | TroVax | | |
| MV-NIS | | gemcitabine prodrug | vinorelbine | | |
| MV-NIS therapy | | HSV-1716 | WT1-targeted vaccine | | |
| ronidociclib | | K562/GM-CSF | YSCMA | | |
| trametinib | | | zoledronic acid | | |

Display Phase 2 drugs in two columns

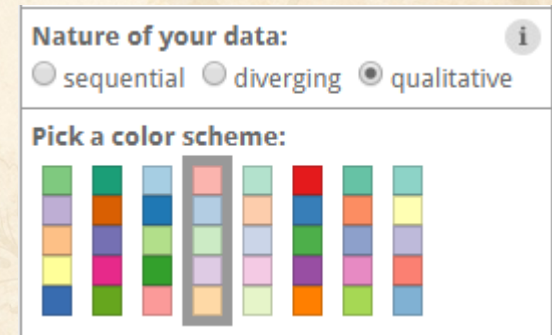
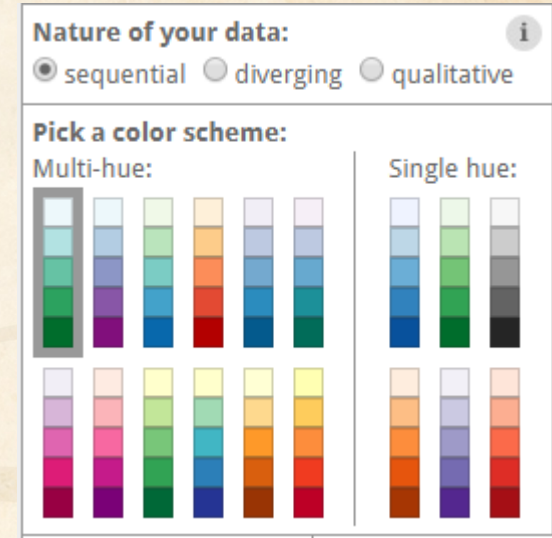
Drug type

- Antibodies
- Cancer vaccines
- Cell/Gene therapies
- Oncolytic viruses
- Peptides/Proteins
- Small molecules

Lessons Learned - Choose the Right Colors

- Color code key should have no more than 8 colors; 5-6 is better.
- For key values with a progression (e.g. phase, trial status) choose a **sequential** color scheme.
- For key values with no order (e.g. companies) choose a **qualitative** color scheme.

COLORBREWER 2.0
color advice for cartography



Piano chart: Qualitative Color Code Key

Merkel cell carcinoma (MCC) pipeline: by Type of Molecule

| Biological Testing | Preclinical | Phase I | Phase II | Launched | Discontinued | No Development Reported |
|--|--|---|--|------------------------|--------------------------------------|-------------------------|
| Merkel cell carcinoma therapies Vironika | CK-301 TG Therapeutics | BGB-A317 Celgene | ALT 803 Altor BioScience Corporation | avelumab Merck KGaA | lorvotuzumab mertansine ImmunoGen | ATN-161 Attenuon |
| | ETBX-051 NantWorks | ID-G100 Immune Design | cabozantinib S-malate Exelixis | | | tivantinib ArQule |
| | ETBX-061 NantWorks | pasireotide Novartis | CST-101 NantWorks | | | |
| | ipilimumab Bristol-Myers Squibb Co | SIRPa-Fc Trillium Therapeutics | F16-IL2 Philogen | | | |
| | LTVax APCure | utomilumab Pfizer | MCPyV vaccine Fred Hutchinson Cancer Research Center | | | |
| | Merkel cell polyomavirus inhibitors Vironika | | nivolumab Ono Pharmaceutical Co Ltd | | | |
| | | | pazopanib GlaxoSmithKline plc | | | |
| | | | pembrolizumab Merck & Co | | | |
| | | | PEN-221 Tarveda Therapeutics | | | |
| | | | sapanisertib Intellikine | | | |
| | | talimogene laherparepvec BioVex Inc | | | | |
| | | tavokinogene telsaplasimid OncoSec Medical | | | | |

Background: Data from Pharmaprojects, R&D Insight, Cortellis was integrated in BizInt Smart Charts, cleaned up and visualized with VP-SCE. Phase for MCC was extracted from the Drug Development Phase field. Values shown are those reported by the databases.

Type of molecule

- Antibody
- Biological, other
- Cell & gene therapy
- Protein & peptide
- Small molecule therapeutic
- Vaccine

Piano chart: Sequential Color Code Key

Merkel cell carcinoma (MCC) trials: by Trial Status

| Phase I | Phase I/II | Phase II | Phase III |
|--|---|---|--|
| NCT02035657 Immune Design | NCT03167164 NantWorks | NCT02054884 Philogen | 2010-023827-34 POLICLINICO UNIVERSITARIO AGOSTINO GEMELLI |
| NCT02831179 National Cancer Institute | NCT03241173 Incyte Corporation | NCT02978625 National Cancer Institute | |
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| NCT01652547 Novartis | | NCT01013779 Trans-Tasman Radiation Oncology Group (TROG) | |
| NCT00002947 National Cancer Institute | | NCT02036476 Exelixis | |
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| | | NCT00003549 National Cancer Institute | |
| | | NCT00004922 National Cancer Institute | |
| | | NCT00068783 National Cancer Institute | |
| | | NCT00079131 National Cancer Institute | |
| | | NCT00869050 Columbia University | |
| | | NCT01440816 OncoSec Medical Incorporated | |
| | | NCT00003514 Burzynski Research Institute | |
| | | NCT01913691 National Cancer Institute | |

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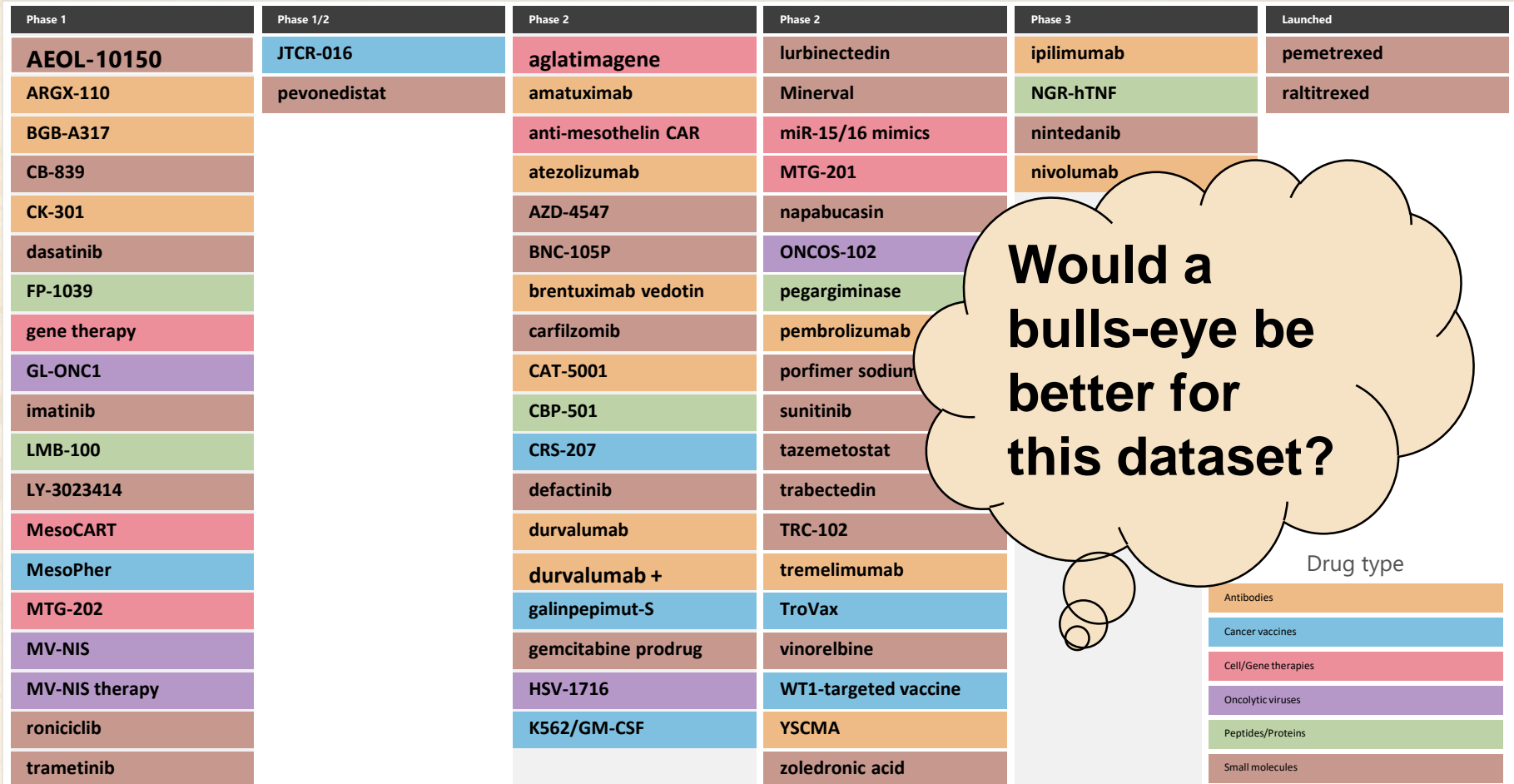
Lessons Learned - The Best Visualization is...

- The one that “tells the story” for your topic and data.
- Try different visualizations and different categorizations/color code keys.
- A visualization that works well for one data set might not be very interesting for your next project.

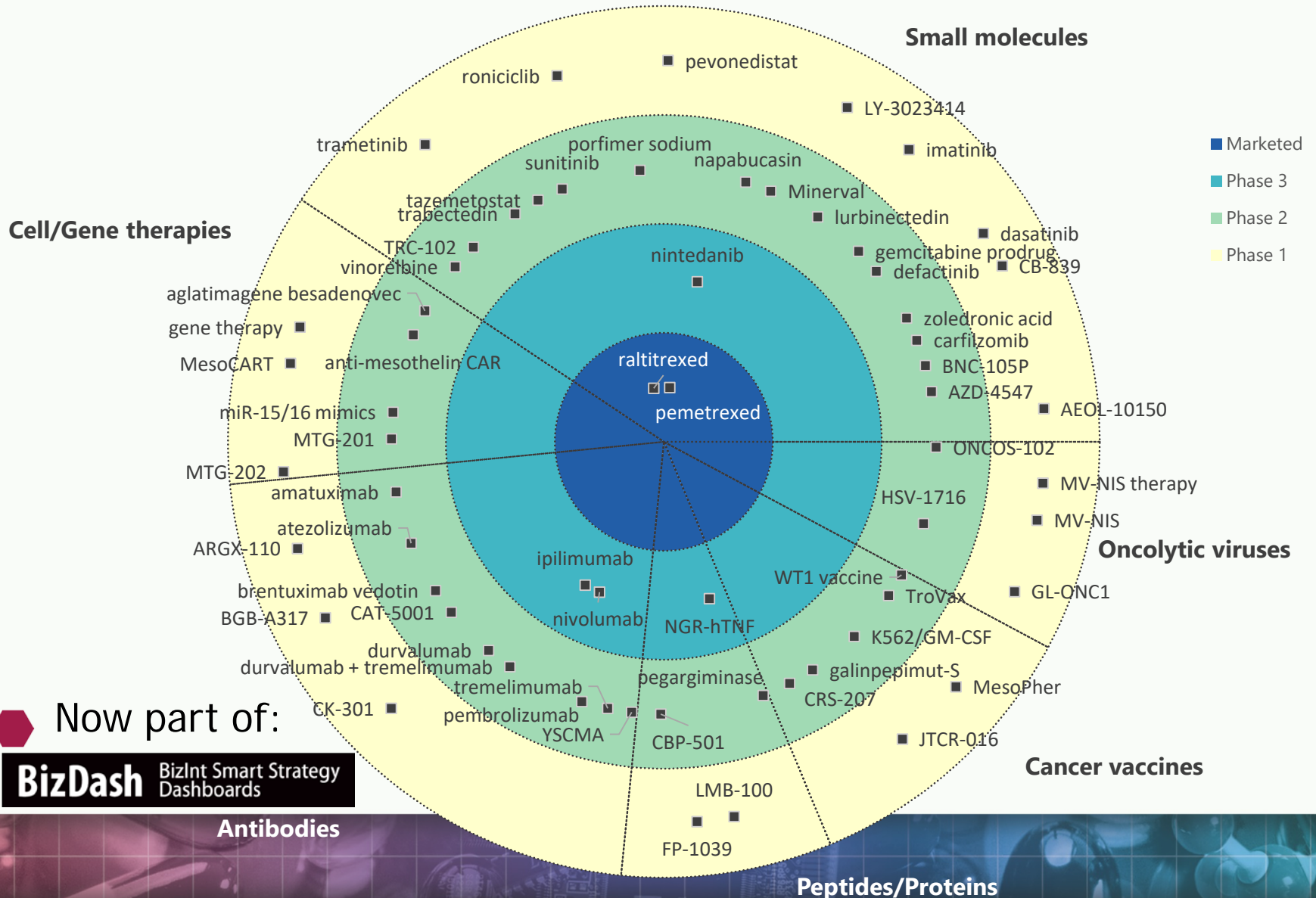


Mesothelioma pipeline in a Piano Chart

Piano Chart – Mesothelioma



Mesothelioma - Bulls-Eye created for PowerPoint



Now part of:

BizDash BizInt Smart Strategy Dashboards

Thank you to my “chef” colleagues at BizInt and VantagePoint!

Matt Eberle
John Willmore, Joe Johnson,
Bertha Adamson
and Jon Garner, Paul Frey,
Nils Newman





Software for
Business Intelligence

BizInt Smart Charts

Questions?

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bizint.com/slides