Taking flight – ZYNTEGLO® FDA approved

August 18, 2022

forward-looking statements

These slides and the accompanying oral presentation contain forward-looking statements and information. The use of words such as “may,” “might,” “will,” “should,” “expect,” “plan,” “anticipate,” “believe,” “estimate,” “project,” “intend,” “future,” “potential,” or “continue,” and other similar expressions are intended to identify forward-looking statements. For example, all statements we make regarding our expectations regarding our programs and therapies, including but not limited to the timing or likelihood of regulatory filings and approvals, our commercialization plans, and addressable market for approved products are forward looking. All forward-looking statements are based on estimates and assumptions by our management that, although we believe to be reasonable, are inherently uncertain. All forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those that we expected. These statements are also subject to a number of material risks and uncertainties that are described in our most recent quarterly report on Form 10-Q, as well as our subsequent filings with the Securities and Exchange Commission. Any forward-looking statement speaks only as of the date on which it was made. We undertake no obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future events or otherwise, except as required by law.

agenda

Welcome and opening remarks

Andrew Obenshain, chief executive officer

Ready to launch ZYNTEGLO®

Tom Klima, chief commercial and operating officer

Strengthened path to financial sustainability

Jason Cole, chief strategy and financial officer

Entering a catalyst-rich period as a commercial company

Andrew Obenshain, chief executive officer

Q&A

Pursuing Curative gene therapies ...

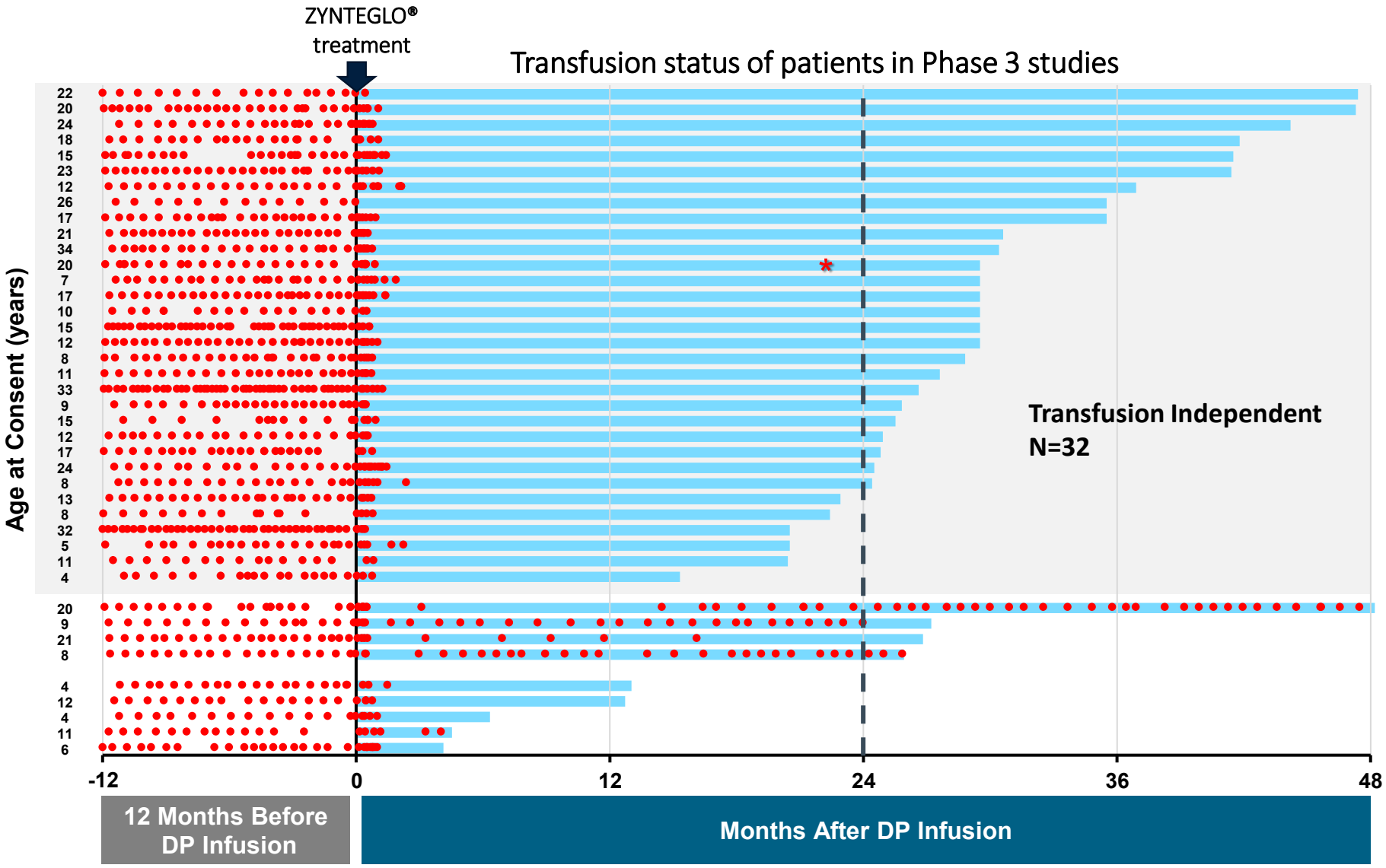
To give patients and their families more bluebird days

Olivia’s Story

ZYNTEGLO: Now FDA Approved

zynteglo®
(betibeglogene autotemcel)
suspension for IV infusion

ZYNTEGLO® approval is underscored by impressive clinical study data



In Phase 3 studies:

- 89% of patients achieved transfusion independence (TI) and normal or near-normal hemoglobin levels
- All patients who achieved TI have remained transfusion free
- Durable results with longest follow-up out to 4 years
- Majority of AEs and SAEs were consistent with myeloablative conditioning

*Patient received acute transfusion for serious blood loss due to orthopedic surgery. DP: Drug Product

Data as of March 2021

Ready to launch ZYNTEGLO®

Tom Klima, Chief Commercial and Operating Officer

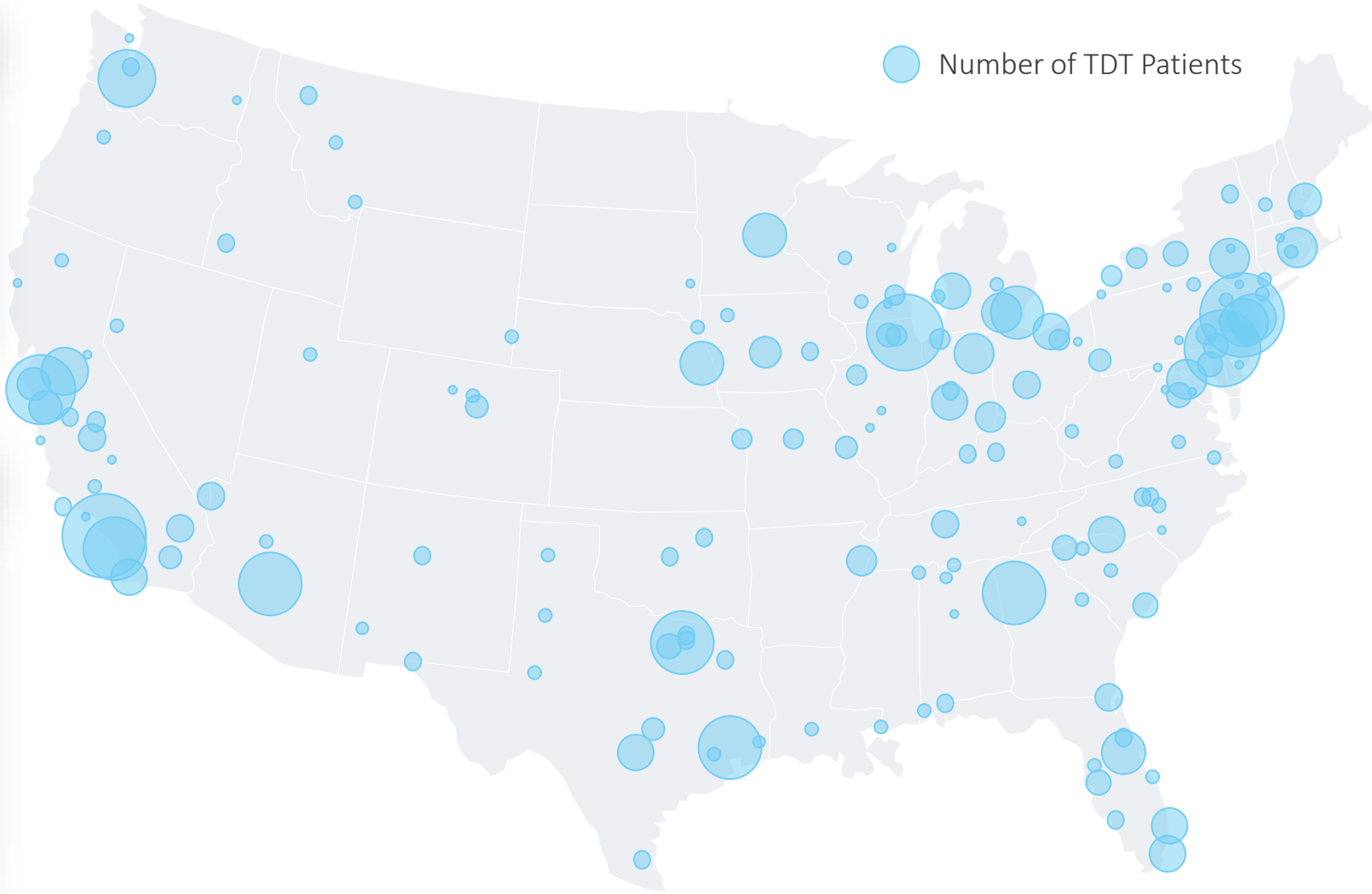
Fit-for-purpose Qualified Treatment Center (QTC) network expected to activate in waves

Targeted QTC selection

- Focused on high prevalence states
- Centers actively treating beta-thalassemia today
- Deep experience with commercial cell and gene therapies

QTC growth aligned with demand

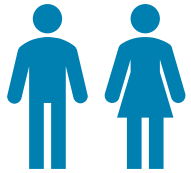
- Wave 1 QTCs to be fully activated by end of September
- Anticipate 1st apheresis in Q4 2022
- Expect to more than double launch network by year end 2022
- Network expands substantially with SCD launch



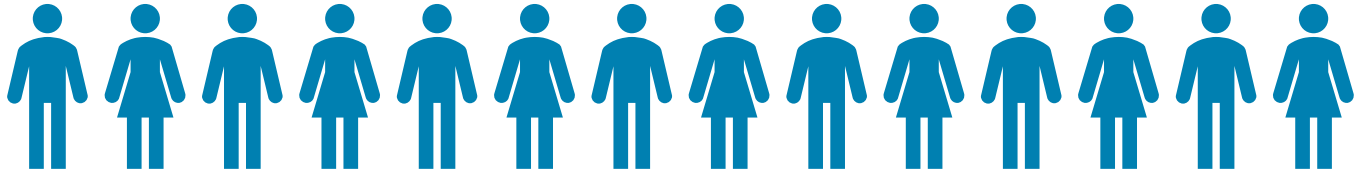
QTC: Qualified Treatment Center

Planned QTC network supports significant U.S. patient opportunity

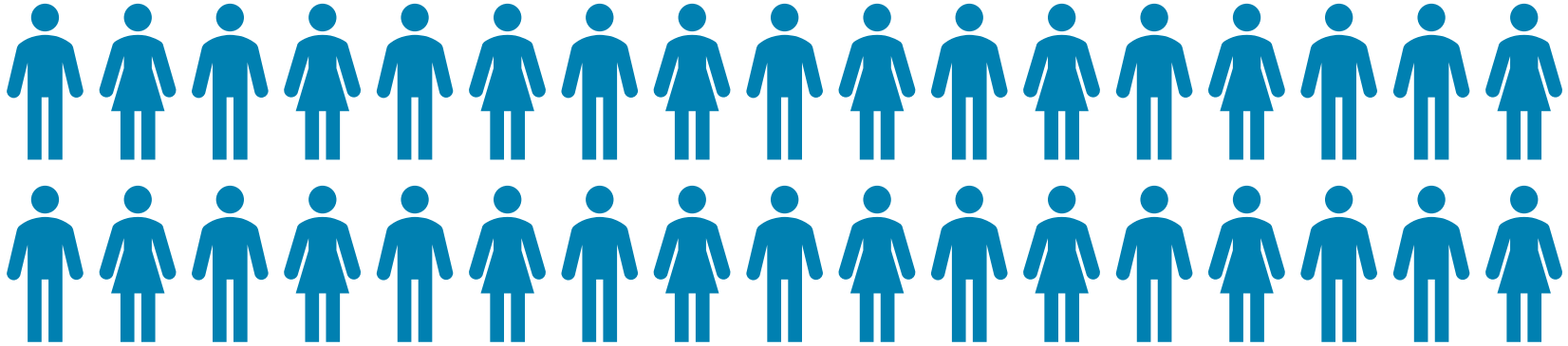
~50 potentially eligible patients currently seen at Wave 1 QTCs



~350 patients eligible with QTC expansion



More than 850 patients likely eligible for ZYNTEGLO®



55 – 60% of the ~1,500 patients with transfusion dependent beta-thalassemia in the US may be eligible for gene therapy

QTC: Qualified Treatment Center

Confident in timely, quality access and reimbursement with upfront payment at $2.8M price

Price tied to recognized value

- Beta-thalassemia requiring regular RBC transfusions is associated with:
  - $6.4 million average lifetime medical care cost per patient[1]
  - 23X higher average total health care cost per patient per year vs. general population[2]
  - Blood transfusions every 2-5 weeks for life[3]

Simple and innovative payment strategy

- bluebird is offering payers:
  - One-time upfront payment
  - Outcomes-based agreement with 80% rebate if patient does not reach transfusion independence within 2 years
  - Clinically-relevant outcome, easily tracked in claims data

Encouraging payer interactions

- All target payers have responded favorably to approach:
  - 70-75% of patients with beta-thalassemia have commercial insurance
  - Engaging with state Medicaid agencies representing ~80% of publicly-insured beta-thalassemia patients

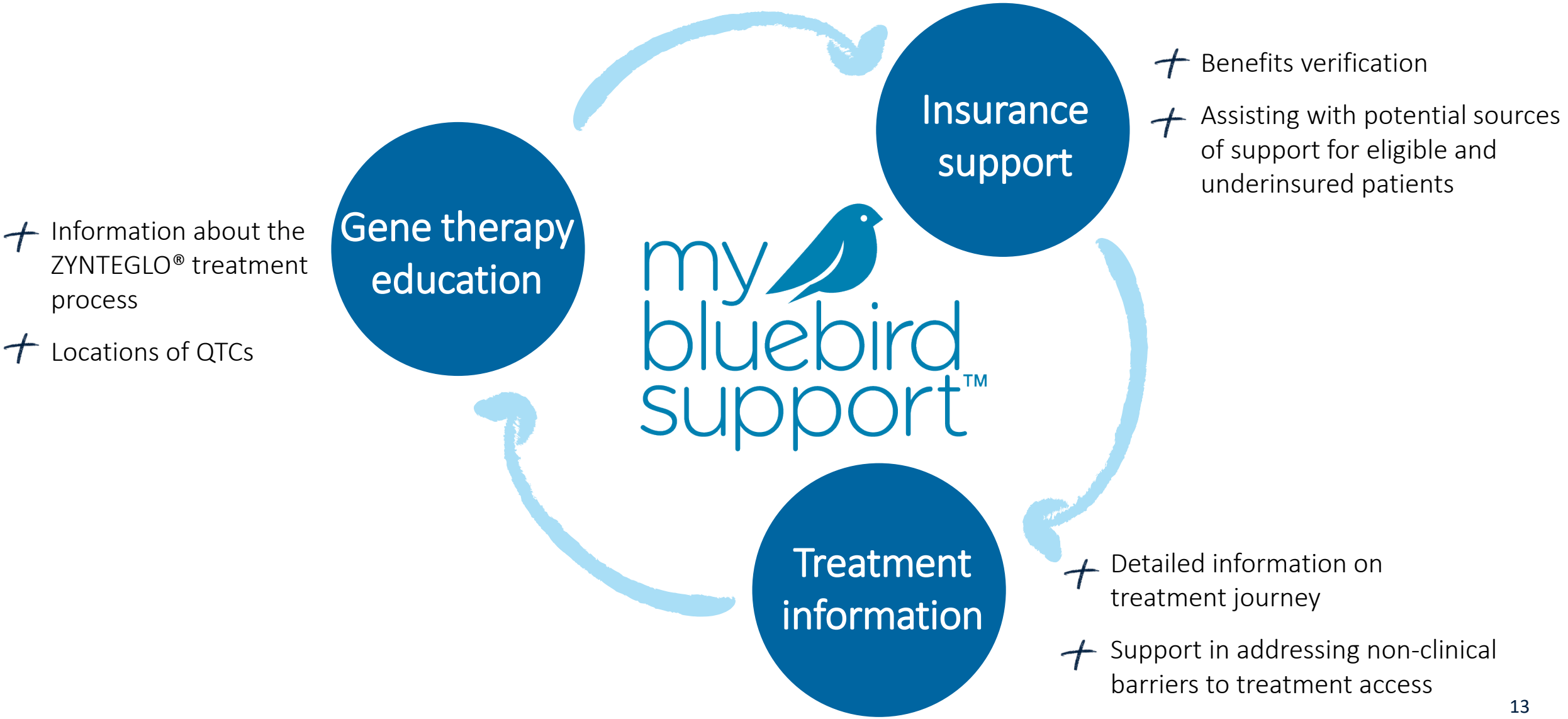
[1] Date on file [2] Weiss et al. 2019 [3]TIF Guidelines

ZYNTEGLO® manufacturing allows for flexible scheduling and is designed to ensure high quality drug product

Bulk of time spent on release testing to ensure high quality drug product

QTC: Qualified Treatment Center; CMO: Contract Manufacturing Organization

my bluebird support helps patients navigate every step of the treatment journey



Strengthened path to financial sustainability

Jason Cole, Chief Strategy & Financial Officer

ZYNTEGLO® approval strengthens financial position

Current cash runway into 1H23

Cash on hand of **$218 million*** as of 6/30/22

Targeting **$60 million** per quarter net cash burn by year end 2022 and carry into 2023

Near-term financing plans bring cash runway into 1H24

$24.7 million in gross ATM proceeds to date

ZYNTEGLO® **PRV in hand** – plan to monetize promptly and maximize value

Additional PRV may be issued upon potential eli-cel approval

Non-dilutive capital

Additional resources may extend cash runway further

Evaluating public and private **equity financings**

Product revenue expected beginning in Q1 2023

*Cash balance includes restricted cash of ~$45 million; PRV: Priority Review Voucher; ATM: At-the-Market equity offering

Entering a catalyst-rich period as a commercial company

Andrew Obenshain, Chief Executive Officer

ZYNTEGLO® approval is the first of several exciting milestones on the horizon

ZYNTEGLO® now FDA approved for patients with beta-thalassemia who require regular RBC transfusions

eli-cel for CALD PDUFA date Sept. 16, 2022

lovo-cel for SCD BLA submission anticipated in Q1 2023

- *Proving our commercial model*
- *Building our infrastructure today*
- *Delivering significant value for patients and shareholders*

Pursuing Curative gene therapies …

To give patients and their families more bluebird days

bluebirdbio®


Q + A