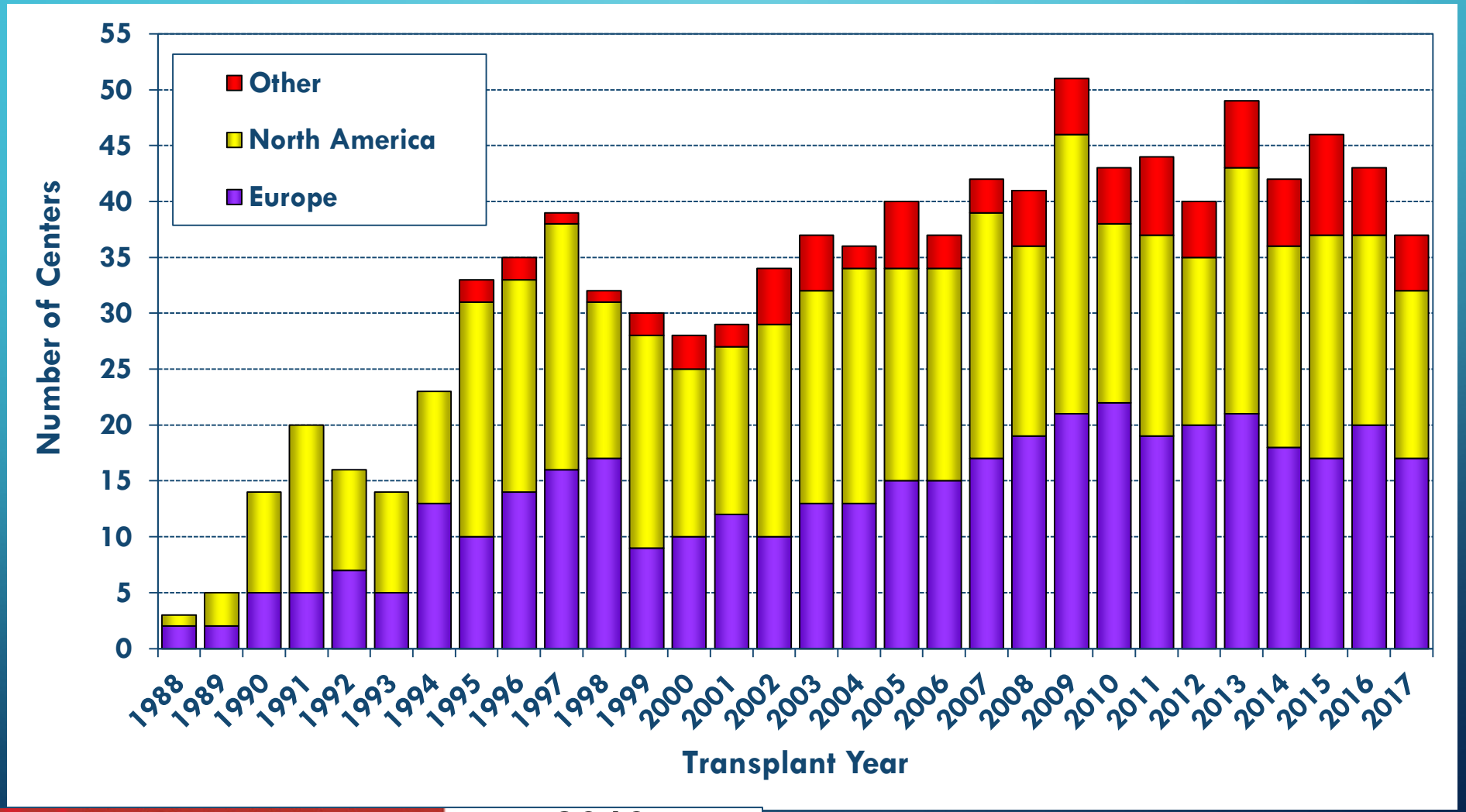
SOLID ORGAN TRANSPLANTATION AND DISABILITY IN CHILDREN AFTER LUNG TRANSPLANTATION

CAROL CONRAD, MD

DIRECTOR, PEDIATRIC LUNG AND HEART-LUNG TRANSPLANT PROGRAM

STANFORD CHILDREN'S HEALTH

PEDIATRIC LUNG TRANSPLANTS
NUMBER OF CENTERS REPORTING TRANSPLANTS BY LOCATION
(Transplants: January 1988 – December 2017)



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Analysis includes deceased and living donor transplants.

PEDIATRIC LUNG TRANSPLANTS

Diagnosis by Age Group (Transplants: January 2002 – June 2018)

Diagnosis	< 1		1-5		6-10		11-17		Ave # per year globally
Cystic Fibrosis	0		4	3.4%	116	48.1	823	65.4%	58
Non CF-bronchiectasis	0		0		2	0.8%	25	2.0%	2
ILD	5	8.1%	6	5.2%	5	2.1%	39	3.1%	3
ILD Other Specify Cause	6	9.7	10	8.6%	21	8.7%	51	4.1%	6
IPAH	7	11.3%	31	26.7%	24	10.0%	112	8.9%	11
PH-not IPAH	16	25.8%	25	21.6%	7	2.9%	27	2.1%	5
Obliterative Bronchiolitis (non-Retransplant)	0		10	8.6%	32	13.3%	60	4.8%	6
Surfactant Protein B Deficiency	14	22.6%	4	3.4%	1	0.4%	0		1
Retransplant (Obliterative Bronchiolitis)	0		4	3.4%	7	2.9%	35	2.8%	4
Retransplant (not Obliterative Bronchiolitis)	0		5	4.3%	7	2.9%	43	3.4%	3
Other	3	4.8%	5	4.3%	11	4.6%	26	2.1%	3

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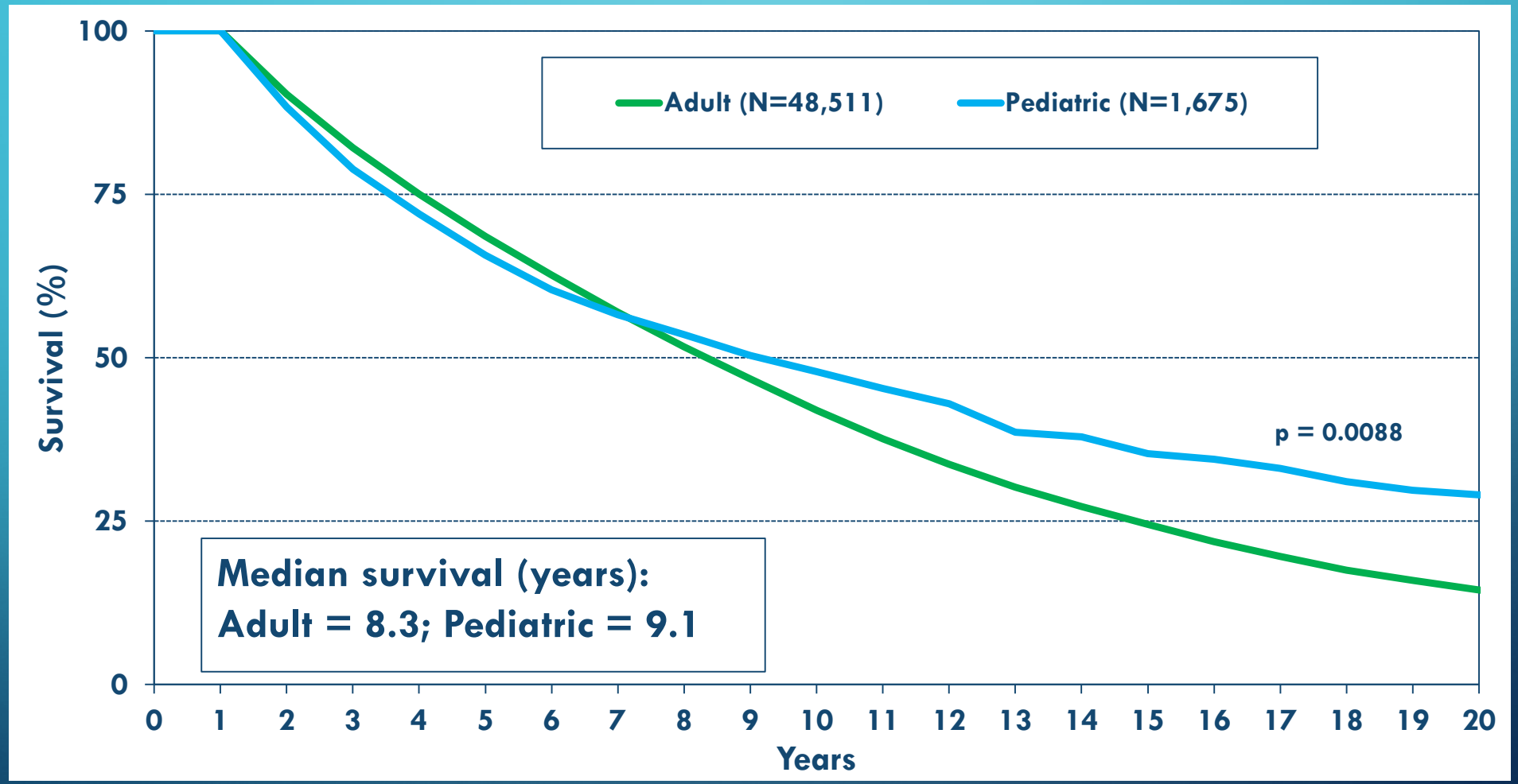
LUNG TRANSPLANTS KAPLAN-MEIER SURVIVAL CONDITIONAL ON SURVIVAL TO 1 YEAR BY RECIPIENT AGE GROUP **(Transplants: January 1992 – June 2017)**



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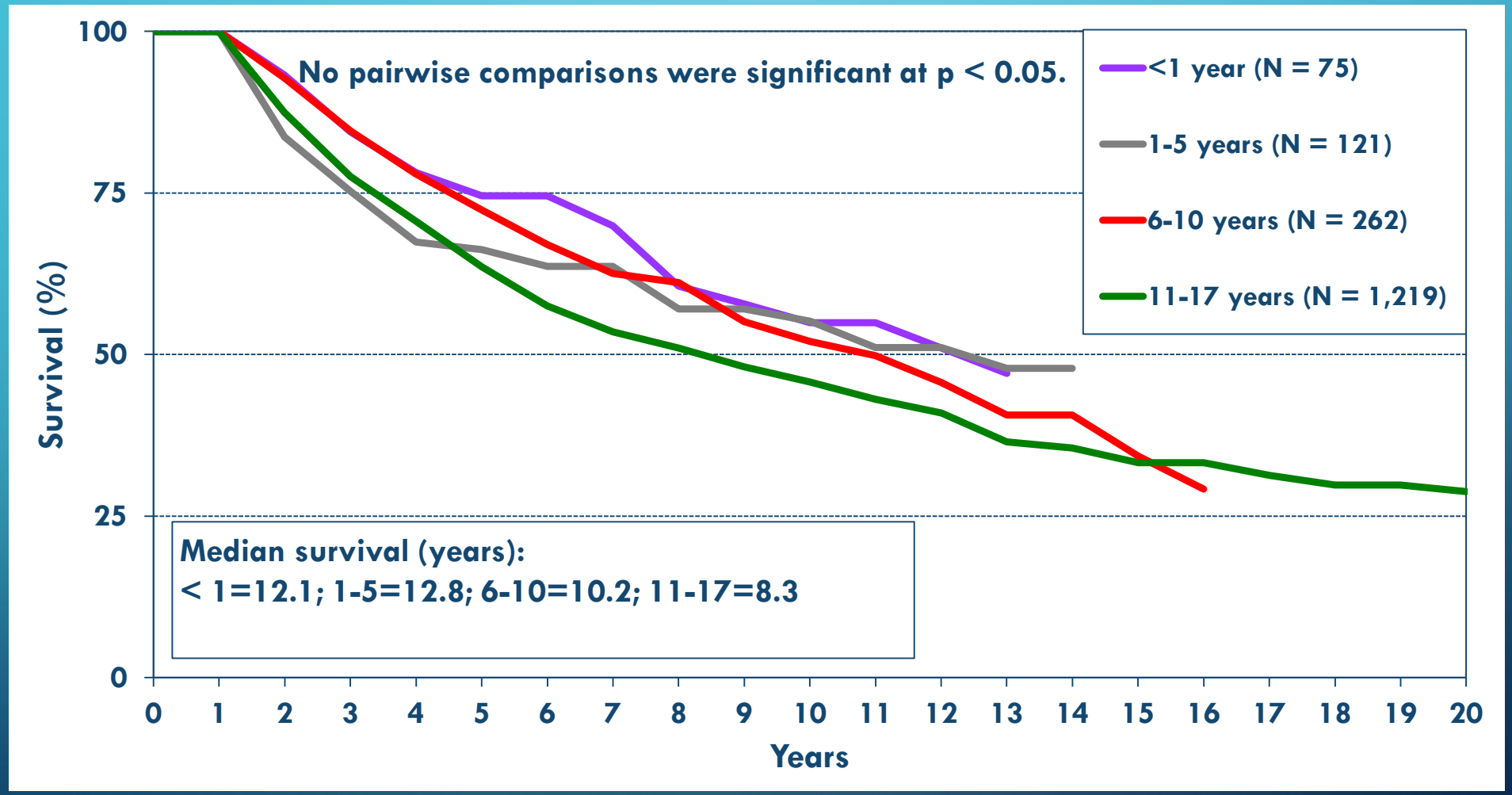
PEDIATRIC LUNG TRANSPLANTS CONDITIONAL KAPLAN-MEIER SURVIVAL BY RECIPIENT AGE GROUP

(Transplants: January 1992 – June 2017)



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EVALUATING THE IMPACT OF REHABILITATION

1. What is the evidence for exercise training in pediatric SOT candidates and recipients?
2. What type(s) of exercise training are recommended in the pre-transplant phase?
3. What type(s) of exercise training are recommended in the early and late posttransplant phases?
4. What are the outcomes relevant to exercise and physical activity that should be measured pre- and post-transplant?

WHAT'S THE PROBLEM?

- High oxygen requirements, abnormal gas exchange
- Abnormal lung mechanics – restricted ability to breathe more deeply
- Cardiovascular limitations- restricted blood flow
- Peripheral muscle dysfunction
- Hospitalization pre-tx due to acute respiratory failure
  - Bridge to transplant therapies
- Complications of the disease occurring pre-tx
- Complications that occur post-tx

WHY IS PHYSICAL CONDITION IMPORTANT?

- Optimal physical function and condition to prepare for LTx
  - Some patients may require a ‘bridge’ to LTx (ECMO), and become quite deconditioned.
- Reduced exercise capacity and levels of physical activity in SOT candidates and recipients are key predictors of clinical outcomes before and after transplantation.
  - Survival to transplantation (survived, died while listed, or delisted) is negatively affected by low physical activity levels.
  - Post-operative mechanical ventilation duration and Intensive care days are affected by low PAL prior to transplant in adults and children.
  - Hospital admission days
  - Improvement of PAL improves these outcomes.

J Heart Lung Transplant. 201. 35:1041–1043
J Heart Lung Transplant. 2017. 36: 780–786
Pediatr Transplantation 2013. 17: 34–40

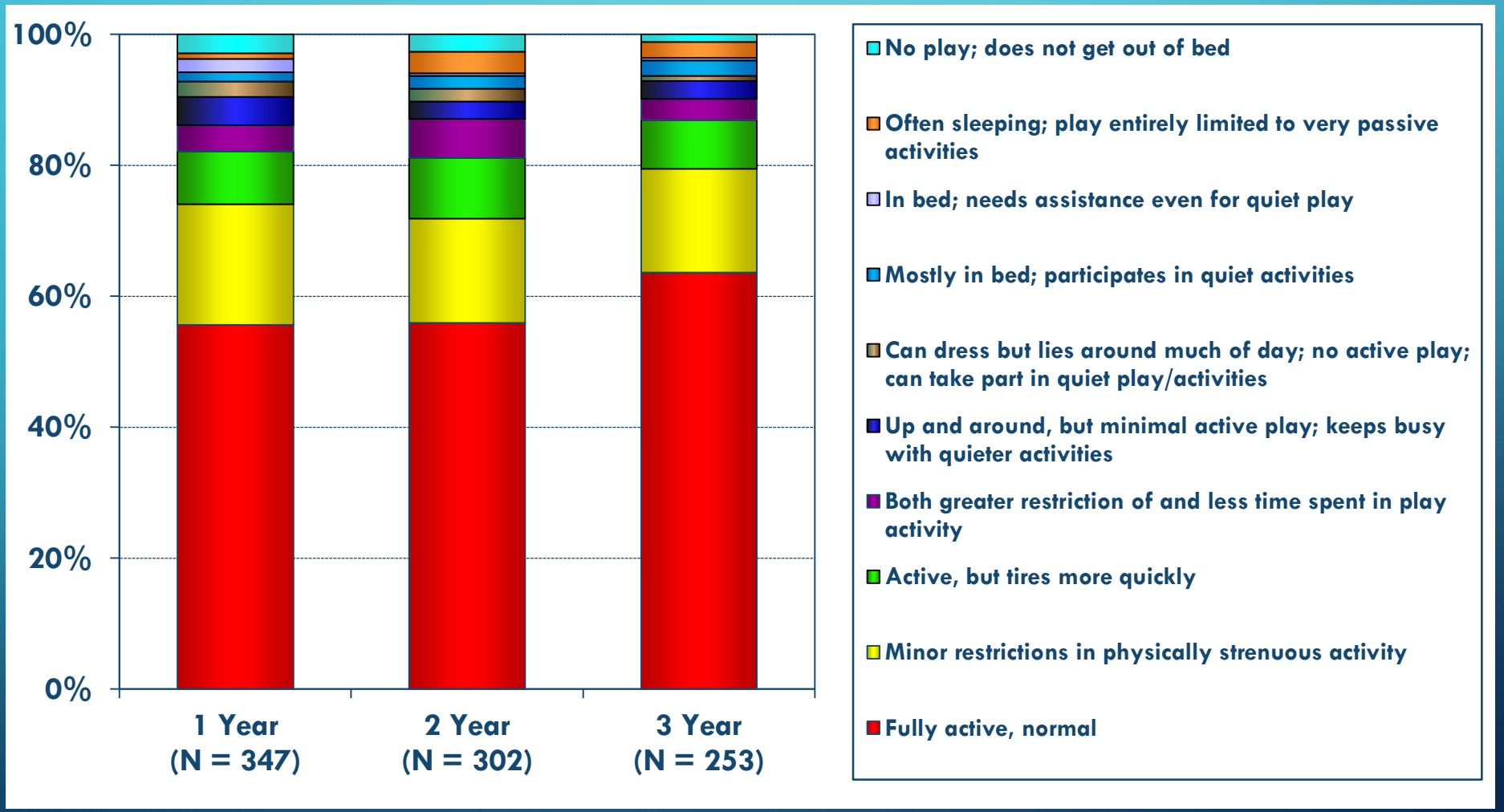
REASONS TO ENGAGE IN PT

- Posttransplant complications can be modified through exercise training and proper nutrition:
  - Cardiovascular risk factors (hypertension, glucose dysregulation, overweight, or obesity)
  - Osteoporosis
  - Muscle atrophy
  - Fatigue
  - Attention levels

HOW TO DETERMINE CANDIDATE'S LEVEL OF FITNESS?

- No specific guidelines exist for rehabilitation in pediatric lung transplant candidates and/or recipients.
  - Most tools have age and developmental limitations
- 'Standard' Measurement Tools
  - Exercise capacity
    - 6 minute walk test
    - Cardiopulmonary exercise test
    - Shuttle walk test
  - Developmental milestones or delay
  - Fatigue scoring – Pediatric QOL (Peds QL) multidimensional fatigue scale.
  - Functional status estimates – Lansky performance status

Pediatric Lung Transplants
Functional Status of Surviving Recipients
(Follow-ups: January 2010 – June 2018)



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ASSESSING CHILDREN

- Peabody Developmental Motor Scales (children younger than 6)
  - Gross and fine motor skills assessment
- Bruininks-Oseretsky test of motor proficiency in children (4 ½ - 14 ½ years)
  - 8 subsets
    - 4 gross motor skills, 3 measure fine motor skills, 1 – both
  - Or a short form with 14 items to briefly survey motor proficiency in general

CONCLUSIONS AND FUTURE DIRECTIONS

- Focusing on optimizing the "normal" childhood activities of going to school and participating in sports can improve the physical, social, cognitive, and mental health outcomes.
- Gauge which interventions promote the best long-term outcomes along with survival are needed.