HOW TO SUPPORT GROWTH AMONG CHILDREN WITH CHRONIC DISEASE?

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NO DISCLOSURE TO DECLARE
Introduction

- Growth is a specificity of childhood
- Malnutrition can appear during the childhood and affects growth
- In the developed world\(^1\): mostly related to chronic disease in children
- Malnutrition in hospitalized children \(^2\): 5-61%
- Any acute illness among chronically ill patient could worsen the existing nutritional status

\(^1\) Mehta et al JPEN 2013  
\(^2\) Joosten et al Arch Dis Child 2009
Plan

- Scope of the problem
- Underlying mechanisms
- Tools to diagnose
- Management of undernutrition in chronic medical condition
SCOPE OF THE PROBLEM
Undernutrition in hospitalized children

- Associated with adverse clinical outcomes\(^1,2\):
  - Neurodevelopmental
  - Longer length of stay
  - Health care costs: at hospital and when discharged
- Children with chronic disease are at risk to develop undernutrition *during hospital’s stay*
- Persistence of difficulties in assessing standard weight, height/length... at admission

\(^1\) Sermet Gaudelus et al AJCN 2000
\(^2\) Joosten et al Arch Dis Child 2009
Different types of undernutrition

- **Normal**
  - Normal weight and height

- **Wasted**
  - Thinner than normal

- **Stunted**
  - Shorter than normal

- **Wasted and stunted**
  - Thinner and shorter than normal

*Unicef cartoon*
UNDERLYING MECHANISMS OF STUNTING
4 Components of stunting in children

- Decreased nutrients intakes
- High caloric needs uncovered
- Nutrients losses
- Altered nutrients utilization

- Difficult assessment of the needs
  - Inflammation / catabolism
  - Vitamins or trace elements deficiencies
  - Recovery from acute phase

- Altered taste
- Leptine / ghrelin dysregulation
- Iatrogenic
- Psychological

- Malabsorption
  - Chronic diarrhea

- Hormonal dysfunction
  - Chronic inflammation / infection
Prevalence of stunting in risk groups

- Congenital heart disease
- Cystic fibrosis
- Chronic liver disease
- Cerebral palsy (CP)

Always in relationship with severity of disease

Poor nutritional status is the second HIT of chronic disease in children

Very HIGH … often more than 50 % among these risk groups!
The central place of the nutritional care

No visit by a dietetician associated with risk of hospital acquired malnutrition \(^1\)!

- Multidisciplinary team:
  - Nutritionist
  - Speech therapist
  - Trained nurses
  - Ped gastro
  - ...

- Ambulatory and not only during hospital’s stay: growth needs time!

\(^1\) Belanger et al J of Ped 2019
SPECIFIC NUTRITIONNAL DIAGNOSIS
Systematic screening for stunting

- Global pediatric examination
- Weight, length/height, MUAC, triceps skinfold, head circumference… we can always assess something!
- Growth curves:
  - Expression in z-scores deviation
  - Dynamic process

Mehta et al JPEN 2013
Measurements of fat mass / fat free mass

- CP children DXA to assess bone mass recommended\(^1\)
  - Possible calculation of fat and fat free mass in children
- Calculation of psoas muscle area on CT scan of children with end stage liver disease\(^2\):  
  - Lower than healthy peers  
  - Independent of height

\(^1\) Romano C JPN 2017  
\(^2\) Lurz E JPN 2018
Use screening tools:

- **STAMP, STRONGkids, PYMS**:
  - underlying disease +++

- No recommendation for a specific one

- Need to be adequate to any of your setting: hospitalization, ambulatory...

→ Awareness tool: follow the plan!

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1 Chourdakis et al Am J Clin Nutr 2015
MANAGEMENT AND INTERVENTION
Cover the high caloric needs

• Assess the caloric needs \(^1, \(^2\) :
  – Indirect calorimetry
  – Schoffield equation

• Follow the recommendations when available :
  – For example :
    • Congenital heart disease : 130-180 kcal/kg/day\(^3\) … without fluid
    • Cystic fibrosis : 130-200 % of daily recommended intakes\(^4\)
    • Cerebral palsy : same dietary needs\(^5\) as for group age

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1 Mehta N JPEN 2017,  
2 Lapillonne A Clin Nutr 2018  
3 Slicker J., Congen Heart Dis 2013  
4 Turck et al Clin Nutr 2016  
5 Romano C JPGN 2017
Improve the nutrient utilization

• Adapt the nutrients to the underlying disease:
  – Diet\(^1\) enrichment in BCAA children with chronic liver disease: improve weight, fat mass, fat free mass, albumin level
  – Check for vitamines deficiencies and adapt supplementation:
    • Key role of vitamine D for CP adolescents\(^2\)
    • Specific need for carnitine supplementation in cardiac and neuromuscular diseases

\(^1\) Ph et al. Clin Nutr ESPEN 2018
\(^2\) Romano C JPGN 2017
Improve the nutrient utilization

• Recombinant growth hormone therapy:
  – Controversial in CF\(^1\): benefit on height, no real benefit on pulmonary function, glucose tolerance to follow
  – No effect on bone mineralization among Crohn’s disease patients despite increased linear growth\(^2\)

• Induction of puberty with sex hormones not recommended

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\(^1\) Thacker V Coch Database 2018
\(^2\) Altowati MA Hormon Research Ped 2018
Improve the nutrients intakes

• Cyproheptadine:
  – Improvement of food intake and weight in patients with medical condition
  – Associated with global feeding program

• Speech therapist, occupational therapist
• Variation in food, textures, enrichment,….
• Add oral supplementation and variety !!!

1 Sant’Anna et al JPNG 2014
Improve the nutrients intakes

- Amount of energy needed is not feasible for the child:
  - Find the right time to introduce the nutritional support:
    - Naso-Gastric Tube
    - Gastrostomy
    - If necessary: parenteral nutrition

- Be careful with homemade blended nutrition

\(^1\) Coad J Arch Dis Child 2017
Stop the nutrients losses

- Look for any other cause of chronic diarrhea
- Slow increase in enrichment: avoid gut overload
- Avoid vomiting: administration of the nutrition should be tailored to tolerance of the child
WHY IS IT SO IMPORTANT?
Effect of growth on long term pulmonary function: cystic fibrosis

- Weight for age at 4 years >50%:
  - Acute pulmonary exacerbations
  - Length of hospital stay
  - Rate of glucose intolerance

- Weight and height at age of 4y impact on patient survival at age of 18-20y

Yen EH J of Pediatric 2013
Congenital heart disease: effect on support need at the ICU

- Duration of inotropic support and BNP increase if triceps skin fold decrease
- Inverse correlation between total body fat mass and BNP levels.
  ➔ Malnourishment is associated with decreased myocardial function.

Radman M J Thorac Cardiovas Surg 2014
WHAT IS THE FUTURE.... ?

What are the new challenges?
Cardiovascular risk after surviving stunting

• Defining marker for increased cardiovascular risk: intima media thickness:
  – liver transplanted children\(^1\): increased intima media thickness associated with increased BMI

• Increase life time expectancy among CF children: increased cardiovascular complications, diabetes

\(^1\) Naeser V et al Pediatr Transpl 2018
Sarcopenic obesity among cancers survivors

- Body composition assessed by DXA among ALL cancer survivors 10 years after diagnostic:
  - Increased fat mass
  - Decreased skeletal muscle mass
  → Sarcopenic obesity prevalent in survivors
  → Associated adverse impact on health related quality of life

Double Jeopardy !!!

Marriott C. Et al Cancer 2018
Sarcopenia and frailty in stunted children

• Described in other ped chronic conditions: scales to assess derived from adult studies
• Nutrition, as any therapy requires follow up:
  – Complications possible!
• Pharmacogenomic in pediatrics has to improve
Sarcopenia and pediatrics?

- Lean mass recovery: what if the muscle is not already formed?
- Physical activity?
  - Children need to continue playing
Take Home Messages

- Undernutrition and stunting are frequent in chronically ill children but not irretrievable: growth is possible.
- Let nutrition be a part of the global management also if no primary digestive disease exists.
- Child tailored nutrition is the goal:
  - Define objectives and assess.
- Avoid long term nutritional complications among «survivors» with promoting physical activity.
THANK YOU FOR YOUR ATTENTION

QUESTIONS ?