The Diagnostic Odyssey for Individuals With Rare Diseases: Pompe Disease and Other Lysosomal Storage Diseases

Jennifer L. Cohen, MD
Assistant Professor of Pediatrics,
Division of Medical Genetics

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Learning objectives/Agenda

- Describe the diagnostic journey for individuals with Pompe disease and other LSDs.
- Explain the challenges and barriers with diagnosis, multi-system health issues and treatment.
  - Apply interprofessional team strategies for improving coordination and communication to support the well-being of both the individual and their family/caregiver(s).
- Discuss emerging diagnostic tools and therapies, recent advances in management options and clinical trials for Pompe disease and other LSDs.
- Incorporate individual and caregiver engagement into shared decision-making.

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Brief overview of Lysosomal Storage Diseases (LSDs)

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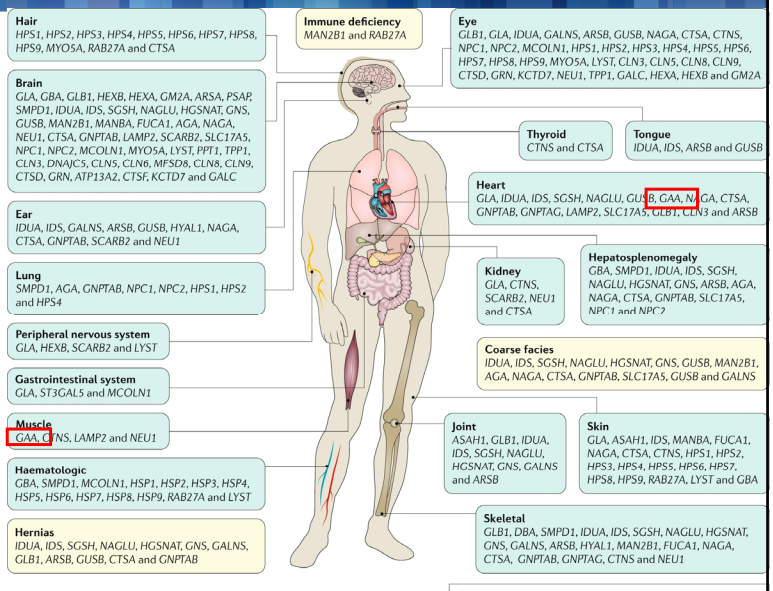
Lysosomal storage diseases: multisystemic

- Group of 70 monogenic disorders
- Individually rare, collectively affect 1:5000 live births
- Clinical spectrum in LSDs – ranging in severity and age of onset



Platt, F.M., d'Azzo, A., Davidson, B.L. *et al.* Lysosomal storage diseases. *Nat Rev Dis Primers* **4**, 27 (2018). https://doi.org/10.1038/s41572-018-0025-4

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Lysosomal storage diseases

- Subcategories of disease
  - i.e. Mucopolysaccharidoses, sphingolipidoses, lipid storage disorders, etc.
- Main available and approved treatment modalities for those that have treatment beyond symptomatic/supportive management:
  - Enzyme Replacement Therapy
  - Hematopoietic stem cell therapy
  - Chaperone therapy
  - Substrate reduction therapy
- Goal of treatments – reduce the build-up of the toxic substrate
  - Replace the enzyme that is missing
  - Directly reduce the toxic substrate

Platt, F.M., d'Azzo, A., Davidson, B.L. *et al.* Lysosomal storage diseases. *Nat Rev Dis Primers* **4**, 27 (2018). https://doi.org/10.1038/s41572-018-0025-4

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Brief overview of Pompe disease

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Pompe disease names and cause

- Lysosomal storage disease and Glycogen Storage Disease (GSD)
- GSD type II
- Synonyms: **Acid Alpha-Glucosidase Deficiency, Acid Maltase Deficiency, GAA Deficiency**
- **Cause of Pompe disease**: Biallelic disease-causing variants in the gene *GAA*, which encodes the enzyme acid alpha-glucosidase
- GAA is a lysosomal enzyme; **glycogen storage** may be observed in the **lysosomes** of muscle cells

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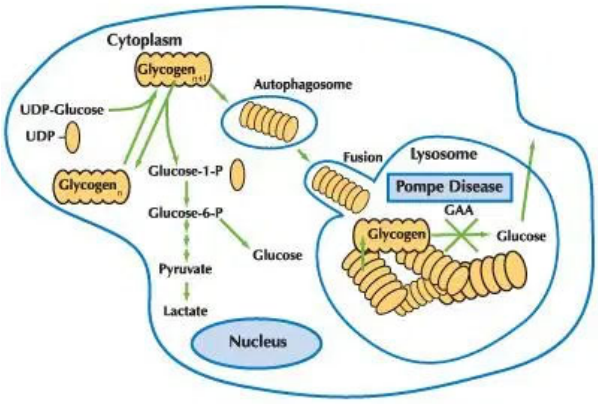
Pompe disease pathophysiology



- Deficient lysosomal enzyme acid alpha-glucosidase (GAA) activity, which catalyzes the breakdown of glycogen to glucose in the lysosome
- Without sufficient GAA activity, glycogen accumulates in the lysosome, causing distention of this organelle

Hirschhorn R, Reuser AJJ. Glycogen storage disease type II: acid alpha-glucosidase (acid maltase) deficiency. In: Scriver C, Beaudet A, Sly W, et al., eds. The Metabolic and Molecular Bases of Inherited Disease. New York: McGraw Hill, 2001: 3389-3420

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Pompe disease classifications and incidence

- Classified by
  - Age of onset
  - Organ involvement
  - Severity
  - Rate of progression
- Infantile onset (IOPD): onset <12 months old **with cardiomyopathy**
- Late onset (LOPD):
  - Individuals with onset <12 months old **without cardiomyopathy**
  - and All individuals with onset >12 months old
- Overall incidence of Pompe (IOPD + LOPD): 1/16,000-1/22,000, following NBS initiation in the US
  - Incidence of IOPD: 1/138,000 to 1/226,000 livebirths worldwide
  - Higher incidence in certain populations (1/50,000, Taiwan)

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Making the diagnosis

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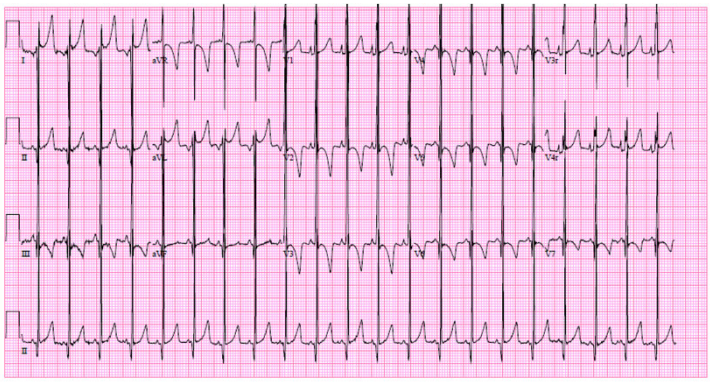
Case 1

- A 4-month old female presents with failure to thrive, difficulty with breastfeeding, hypotonia, and cardiomegaly on chest X-ray, shortened PR interval on EKG
- Initial work up might include:
  - Echocardiogram
  - Physical therapy evaluation
  - Lab tests: CK, AST, ALT



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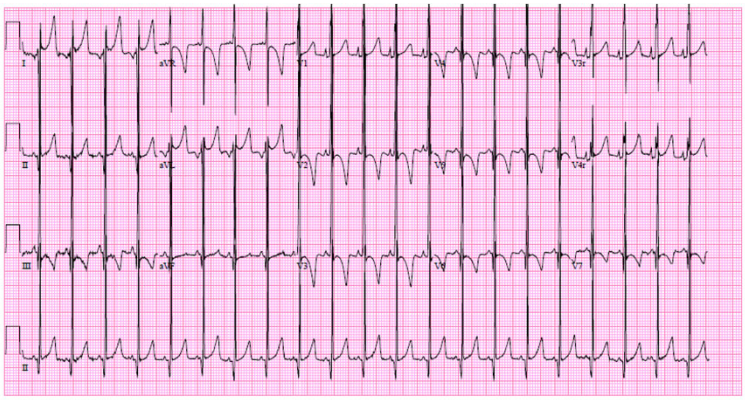
Case 1

- Concern for infantile onset Pompe disease



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Infantile-Onset Pompe Disease (IOPD)

- **Incidence of IOPD:** 1 in 138,000 to 1 in 226,600
- **Definition of IOPD**: onset before 12 months old + cardiomyopathy
- **Symptoms**: may present *in utero* and certainly in neonatal period; median age of presentation is 4 months with systemic involvement:
  - Hypertrophic cardiomyopathy
  - FTT and feeding difficulties
  - Respiratory distress
  - Hypotonia and generalized muscle weakness
  - Biomarker abnormalities
- **Natural history/prognosis**: Without treatment by enzyme replacement therapy (ERT), IOPD commonly results in death by age two years from progressive LV outflow obstruction and respiratory insufficiency
  - Even if properly treated early on, limitations to current treatment remain

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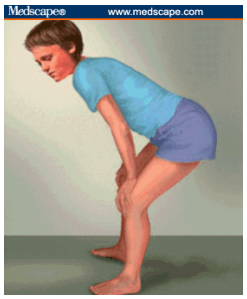
Case 2

- A 20 year old male presents with progressive proximal weakening of skeletal muscles (trunk, lower limbs), elevated "liver enzymes" on routine CMP, and some respiratory difficulties
- Initial work-up might include
  - Pulmonary function tests
  - Physical therapy evaluation
  - EMG
  - Laboratory tests



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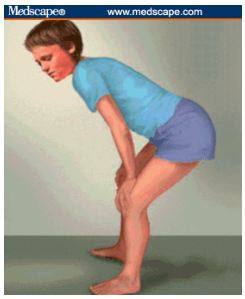
Case 2

- Concern for late-onset Pompe disease



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Late Onset Pompe Disease (LOPD)

- **Progressive proximal muscle weakness (95%)**
- Respiratory insufficiency/increased respiratory infections
- Exercise intolerance
- Exertional dyspnea
- Orthopnea
- Sleep apnea
- Hyperlordosis and/or scoliosis
- Chronic pain
- Decreased deep tendon reflexes
- Gower sign
- Joint contractures
- Difficulty chewing and swallowing
- GI symptoms, including irritable bowel-like symptoms

Hirschhorn & Reuser 2001; Winkel et al., 2005; GeneReviews

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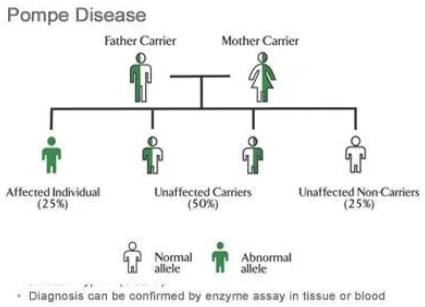
Pompe disease testing

- The **diagnosis** is established in a proband (patient) with either **deficiency of** acid alpha-glucosidase (GAA) **enzyme activity** (biochemical testing) and/or **biallelic pathogenic variants in *GAA* gene** on molecular genetic testing
  - Biallelic – **two variants** *in trans* – one on maternal chromosome allele and one on paternal chromosome allele
    - Also known as autosomal recessive inheritance pattern
  - Pathogenic/likely pathogenic – known to be disease causing (this is based on a variety of factors and lab variant curation to determine how deleterious a variant is) and will be reported out on a genetics lab report
    - Pseudodeficiency alleles are not pathogenic but can cause falsely low enzyme activity
    - Variants of uncertain significance – may be clinically relevant



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Pompe disease testing

- Preferable: Non-invasive **GAA enzyme assay and/or *GAA* gene sequencing testing**
  - Help determine the classification of Pompe disease (IOPD vs. LOPD)
- Electrophysiological studies (EMG) or muscle biopsy can be helpful in some cases
  - In LOPD, biopsy may be normal, so can be misleading
- Positive newborn screening (NBS) results: acid alpha-glucosidase (GAA) enzyme activity performed on dried blood spots

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Pompe disease supportive lab findings

- Elevated serum creatine kinase
- Elevated urinary Glc4, also known as Hex4 (biomarker with age-dependent norms)
  - Seen in other glycogen storage diseases too (ie. hepatic GSDs)
    - recall that Pompe disease is an LSD and GSD
  - Glc4 May be normal in LOPD
    - Still useful in LOPD
      - if it is normal it does not *exclude* a diagnosis
      - if abnormal it tells us either very early or at very late stage

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Diagnostic Journey: Differences between IOPD and LOPD diagnostic journeys

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Testing for IOPD and LOPD: similarities and differences

- Initial reason for presentation/symptomatology may be different, but the laboratory diagnostic testing is identical for IOPD and LOPD
  - IOPD and LOPD will be diagnosed using the same methodology (GAA enzyme testing and molecular genetic testing)
- The results of the GAA enzyme activity (in skin or muscle) and *GAA* gene sequencing results can help differentiate the two from one another
- Symptomatology and age of onset can help differentiate the two types as well
  - Most important is **cardiomyopathy in first year of life** – indicates IOPD

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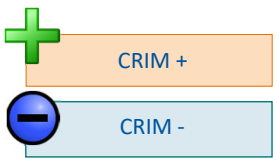
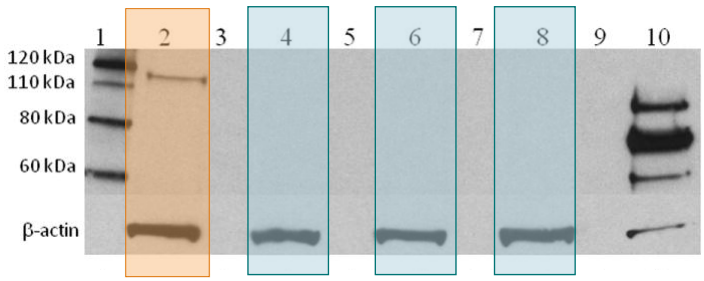
Cross-reactive immunologic material (CRIM)

- CRIM-positive indicates **some endogenous enzyme made** (most Pompe patients)
- CRIM-negative **high risk of neutralizing antibodies**; associated with **worse outcome** and risk of **adverse drug reaction**
  - Most severe form of IOPD
- Can test blood and run western blot; molecular variants can also help predict CRIM status





Bali et al., Am J Med Genet C Semin Med Genet., 2012

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Testing guiding classification

- As a general rule, the lower the GAA enzyme activity (in skin or muscle, not blood), the earlier the age of onset of disease:
  - **Complete** deficiency of GAA enzyme activity (<1% of normal controls) is associated with IOPD
  - **Partial** deficiency of GAA enzyme activity (~2%-40% of normal controls) is associated with LOPD

GAA enzyme turnaround time is on the order of days

- Molecular testing: single-gene testing, targeted analysis for known pathogenic variants (family history), or a multigene panel.
  - A **multigene panel** that includes GAA and other genes of interest (i.e. Neuromuscular panels)

Sequencing testing for multigene panel is about 4 weeks turnaround time typically; single-gene testing for GAA alone is typically faster

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Summary of IOPD vs. LOPD

IOPD

- Age of onset: <12 months
- Typically <1% GAA activity
- Rapid progression with primary cardiac involvement
  - Hypotonia, muscle weakness, respiratory distress
- Mean age of diagnosis: 3.5 months
- May be CRIM-negative: lack of endogenous GAA
  - May develop high antibody titers to exogenous GAA (ERT)
  - Can have poor outcomes despite proper disease management, especially if treated late

LOPD

- Age of onset: any age (can be <12 months)
- 2-40% GAA activity level
- Gradual and varying degrees of progression resulting in primarily profound muscle weakness
  - Wheelchair dependency and respiratory failure
- Mean age of diagnosis: 35.4 years
- CRIM-positive: residual GAA

*Most important tests to confirm or rule out the diagnosis: **GAA enzyme** activity and molecular **GAA gene sequencing***

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Diagnostic Challenges

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Expansive molecular testing can miss a diagnosis

- Identification of biallelic *GAA* pathogenic variants is confirmatory
- Many neuromuscular gene panels have *GAA* gene on them; this testing is best sent in conjunction with **geneticist and genetic counselor** to ensure proper pre- and post-test counseling
- A molecular first approach (such as exome sequencing) may miss some diagnoses
  - Gold-standard diagnostic test is acid **alpha-glucosidase (GAA) enzyme assay** on skin fibroblasts, muscle or blood
    - Blood is easiest and least invasive and can help make diagnosis of Pompe, but not the distinction between LOPD and IOPD
- Consider tests specific to Pompe disease (i.e. GAA enzyme assay) when expansive genetic testing, such as whole exome sequencing (WES), does not provide a diagnosis in a patient with proximal myopathy, progressive respiratory failure or other subtle symptoms of Pompe disease

Mori et al., Mol Genet Metab. 2017 Dec;122(4):189-197

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Expansive molecular testing can miss a diagnosis

- Next-generation sequencing (technology used in gene panels) and exome sequencing, can miss an LSD diagnosis if done in isolation
- Importance of doing the **biochemical testing** first or simultaneously
- Advantage of LSDs is that biochemical testing exists for most
  - If there is a high suspicion for a particular diagnosis, sending targeted Sanger sequencing for the gene is best; today, labs often use Sanger sequencing only for confirmation of findings on NGS or exome

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Nuances of GAA enzyme assay

- GAA enzyme assay
  - Ensure you look at the norms for the particular lab that ran the patient's enzyme sample
    - Norms are *not* age-dependent
  - Carriers of Pompe disease may be below average for GAA enzyme levels, but will not be in the same range as an affected patient
  - Pseudodeficiency is a phenomenon that is a lab-specific artifact causing lowering of the GAA enzyme assay but does not cause truly low enzyme activity in the patient, and therefore does not cause disease
    - Molecular testing can help clarify if a patient has a pseudodeficiency variant vs. a pathogenic variant
- GAA enzyme assay can be sent from primary care but should be interpreted by an experienced lab that deals with this test regularly (on their test menu)
  - Reach out to your local genetics team (e-consult, etc.) to ask them where it will be best to send the enzyme assay to
  - A Genetics Biochemical Laboratory (i.e. Duke) is an appropriate lab to send to

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Genetic testing

- Cures Act:
  - New law in place that pushes the release of all laboratory testing, including genetic testing automatically to the patient, even before the provider may see it
- Genetic test results are oftentimes not straightforward and can sometimes cause more confusion and potentially unnecessary worry if they are not explained properly
- Pre-test and post-test genetic counseling is important

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Challenges to multi-system health

Interprofessional team strategies for improving coordination and communication

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Subspecialty providers who are likely to make the diagnosis

- Genetics
- Cardiology (for IOPD)
- Neonatology
- Pediatric neurology
  - Neuromuscular neurology
- Pulmonology

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New Diagnosis

- How and what type of information clinicians should give to newly diagnosed families
  - New diagnoses can be overwhelming
  - Remember that LSDs have wide spectrum of age of onset and severity; critical to be in contact with the geneticist who confirmed diagnosis
    - *Genotype (the specific genetic variants) can guide phenotype (severity and age of onset)*
- Meet patients where they are at – what is the best way that they learn, communicate
  - Register them with MyChart before they leave the clinic
  - For emerging therapies – teaching patients how to use clinicatrials.gov – to empower them to look for themselves
- Important to direct patients to reliable, curated, resources and guide them to resources relevant to their particular disease subset: i.e. IOPD vs. LOPD
  - GeneReviews is a reliable source for providers; the 'UpToDate' for Genetic Diseases
  - https://www.ncbi.nlm.nih.gov/books/NBK1116/
  - Quick read and has key information
- Recognize the immensity of what it is to cope with a complex chronic diagnosis
  - Reminding patient they are not alone in this and providing reliable resources

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Subspecialty providers following a diagnosis

- Genetics
- Cardiology
- Neuromuscular neurology
- Gastroenterology/Nutrition
- Pulmonology
- Speech therapy
- Orthopedics
- Surgery (port placement for infusions, G-tube surgery if needed)
- +/- Audiology
- Home health nursing
- Care coordination teams (i.e. complex care teams)
- Case management teams
- Social Work

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Subspecialty providers: experience

- Ensuring that the subspecialty providers have experience with Pompe disease and the needs of this patient population
  - Physical therapy
  - Speech therapy (IOPD)
  - Pulmonology
  - Gastroenterology/Surgery (IOPD)
- Examples of nuanced subspecialty care:
  - Avoiding Gastro-jejunal (GJ) tube if possible, and instead pursuing G-tube if needed (IOPD)
  - Avoiding CPAP (other than rare instances of sleep apnea) and prescribing BiPAP if needed for breathing help (LOPD)

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Subspecialty providers: experience

- Models of care can look different depending on the resources you have access to
- Examples of care models
  - Patients come to Duke's Pompe Clinical/Research Center for an annual visit and have local providers (neurology or genetics) that they see more frequently
  - Patients have a large tertiary care center more local to them and see us even less frequently just to stay in touch with the latest and most updated recommendations
- If patients are unable to travel, PCP can:
  - Reach out to the researcher/clinician who authored a paper on the disease in question, as they may provide a recommended contact who is experienced and more local to your patient

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Challenges to multi-system health

- Coordinating multiple appointments
- Barriers to care
  - Transportation
  - Billing concerns: what testing or therapies may or may not be covered; work with financial care counselor in clinic
  - Social complexity risk factors
  - Missing work or school for multiple specialty appointments
  - Language: using interpreter services; some pharmaceutical companies have therapy package insert in at least Spanish

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Challenges to multi-system health

- Ideally care coordination should come from the primary care provider/medical home but not all offices have dedicated resources for this care coordination
  - As the PCP/medical home, reach out to the local subspecialists to ensure good care coordination and communication among team members
  - Using secure messaging in EMR to providers in and outside of the same organization
  - If there is a barrier that the family is facing, communicating with other team members will help keep patient's needs at the center
  - Advocating for the patient if you have knowledge of something to share with other team members
  - Utilize the entire team in a primary practice; involve any available support staff to help with this coordination

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Coordinating multisystem health

Additional resources to seek out

- Home health nursing
- Aide support at home
- Local state-facilitated care coordination support that you can apply for
- Care coordination teams such as complex care teams
  - Case management teams – medication needs
  - Support from pharmaceutical companies – helping to problem solve
  - Social work
- Adolescents – transitional care needs and planning ahead if you are a pediatrician that won't be able to follow the patient as an adult
  - Start talking about autonomy and transition in early adolescence
- Palliative care - for any complex chronic illness, a whole family to consider
  - Having support if that is available

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Emerging diagnostic tools and therapies: Pompe disease

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Optimizing timing of treatment through NBS in U.S.

- Earlier diagnosis through Newborn Screen (NBS)
  - Added to Recommended Uniform Screening Panel (RUSP) in 2015
- Methodology: dried blood spot enzyme assay

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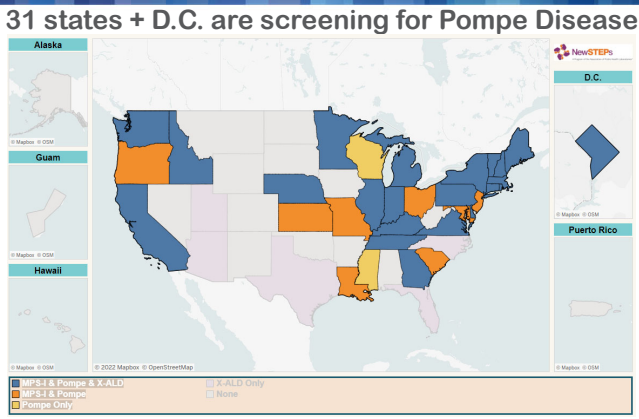
Newborn screening: Days matter



- Extensive research and experience show that **DAYS matter** in the diagnosis and treatment of infantile onset Pompe disease (IOPD)
- **Significantly better clinical outcomes** when diagnosis and treatment are initiated within first few days of life

https://www.newsteps.org/resources/data-visualizations/newborn-screening-status-all-disorders

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FDA-approved treatments

- Myozyme/Lumizyme (alglucosidase alfa): standard of care enzyme replacement therapy
- Nexviazyme (avalglucosidase alfa): FDA-approval in August 2021 for **LOPD**
  - Based on phase 3 COMET trial and phase 2 mini-COMET trial
  - Meaningful improvements in respiratory muscle function and mobility demonstrating comparable efficacy to Lumizyme

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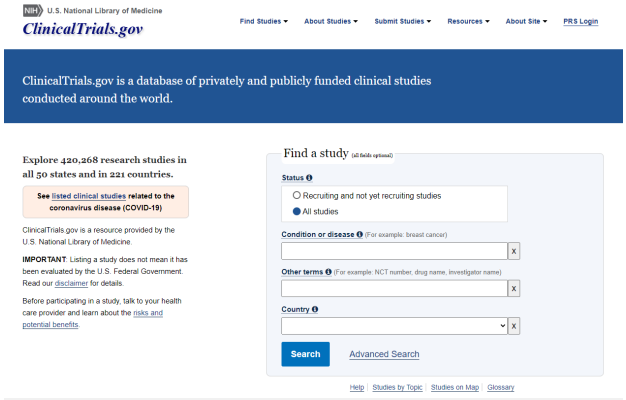
Clinical trials

- Clinicaltrials.gov is the main site for all active trials, worldwide
  - Provide this link to patients to empower them to take an active role in their healthcare and participation in trials



- European equivalent: EU clinical trials register
  - https://www.clinicaltrialsregister.eu/ctr-search/search

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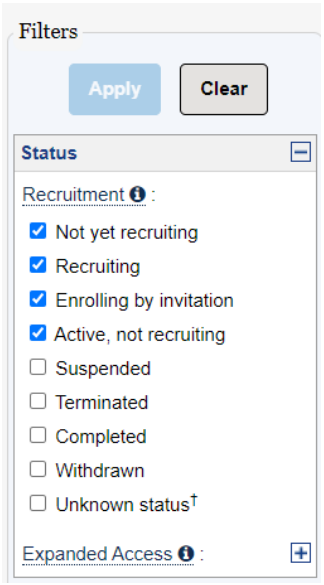
Clinical trials: Pompe disease

- "Pompe disease" in search bar yields 140 results
- Filter by status for those that are not terminated, suspended, completed, or withdrawn: yields **43 studies**



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Clinical trials: Pompe disease

- Trials include
  - observational studies (i.e. natural history, diagnostic tests) and
  - interventional studies (i.e. drugs or biological interventions)
- Studies include those for IOPD and for LOPD
- Interventional studies include
  - Next generation enzyme replacement therapies
  - Gene therapies
  - In utero enzyme replacement therapy for 8 different infantile onset LSDs
- FDA has accepted for review the Biologics License Application (BLA) for cipaglucosidase alfa and the New Drug Application (NDA) for miglustat for **AT-GAA,** Amicus' investigational two-component therapy for the treatment of Pompe disease

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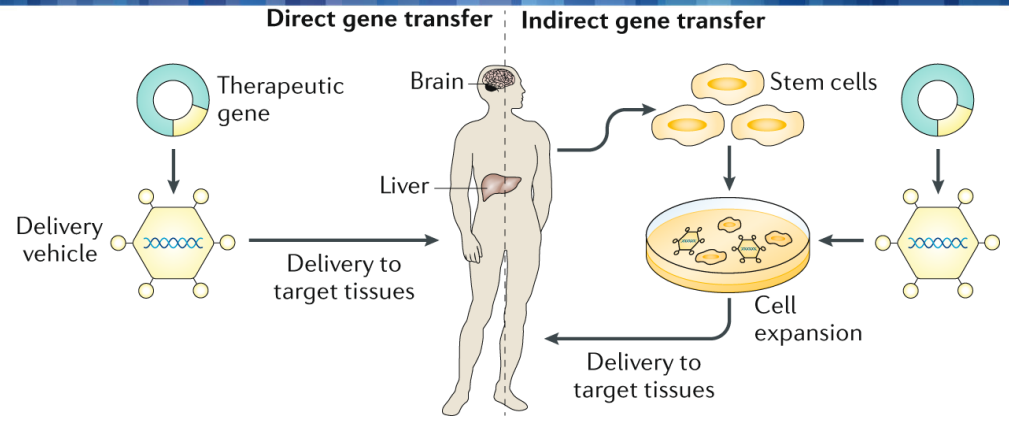
Gene therapy



Two main methods

- Direct gene transfer – utilizes vector such as adeno-associated virus
- Indirect gene transfer utilizes autologous stem cell transplantation and requires bone marrow ablation

Platt, F.M., d'Azzo, A., Davidson, B.L. *et al.* Lysosomal storage diseases. *Nat Rev Dis Primers* **4**, 27 (2018). https://doi.org/10.1038/s41572-018-0025-4

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Clinical trials: Pompe disease

- Gene therapy trials
  - **Gene Transfer Study in Patients With Late Onset Pompe Disease (FORTIS)**
    - A Phase 1/2, Open-Label, Ascending-Dose Clinical Study to Evaluate the Safety and Preliminary Efficacy of AT845, an AAV8-Delivered **Gene Transfer Therapy** in Patients With Late Onset **Pompe Disease**
    - Astellas **Gene Therapies**
    - Active, not recruiting
  - **Safety Study of Recombinant Adeno-Associated Virus Acid Alpha-Glucosidase to Treat Pompe Disease**
    - Phase I/II Trial of Diaphragm Delivery of Recombinant Adeno-Associated Virus Acid **Alpha-Glucosidase** (rAAV1-CMV-GAA) **Gene** Vector in Patients With **Pompe Disease**
    - University of Florida
    - Completed

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Clinical trials: Pompe disease

- Gene therapy trials
  - **AAV2/8-LSPhGAA (ACTUS-101) in Late-Onset Pompe Disease**
    - A Phase 1 Study of the Safety of AAV2/8-LSPhGAA (ACTUS-101) in Late-onset Pompe Disease
    - Asklepios Biopharmaceutical
  - **A Gene Transfer Study for Late-Onset Pompe Disease (RESOLUTE)**
    - Phase 1/2, Dose-escalation Study to Evaluate the Safety, Tolerability and Efficacy of a Single Intravenous Infusion of SPK-3006 in Adults With Late-onset **Pompe Disease**
      - SPK-3006: adeno-associated viral (AAV) vector
    - Spark Therapeutics
  - **Re-administration of Intramuscular AAV9 in Patients With Late-Onset Pompe Disease (AAV9-GAA_IM)**
    - Evaluation of Re-administration of Recombinant Adeno-Associated Virus Acid **Alpha-Glucosidase** (rAAV9-DES-hGAA) in Patients With Late-Onset **Pompe Disease** (LOPD)
    - University of Florida

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Gene therapy

- Challenges in the field of gene therapy
  - Preexisting anti-AAV antibodies – may exclude enrollment
  - Immune response – causing serious adverse events and/or diminishing efficacy of the transgene
  - Patients may need re-dosing, but not fully sorted out how to do that (removal of anti-AAV antibodies, for example)

All of these challenges are being heavily studied through trials and preclinical work

- Health system challenges
  - Fragmented approaches to implementing new technology and new therapies depending on the specialty that "owns" the disease/treatment
  - Ensuring that clinicians and patients are aware of the emerging therapies available

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Discussing trials with patients

- Observational studies
  - Low risk
  - Can benefit the research community regarding the patient's disease
  - Mainly providing medical records to a researcher collecting information to better understand disease in hopes of creating therapeutics in the future
- Investigational drug studies
  - Higher risk
  - Can be evaluating dose and safety
  - Can be evaluating efficacy
  - Stricter inclusion/exclusion criteria
- Participation in any trial should always be voluntary

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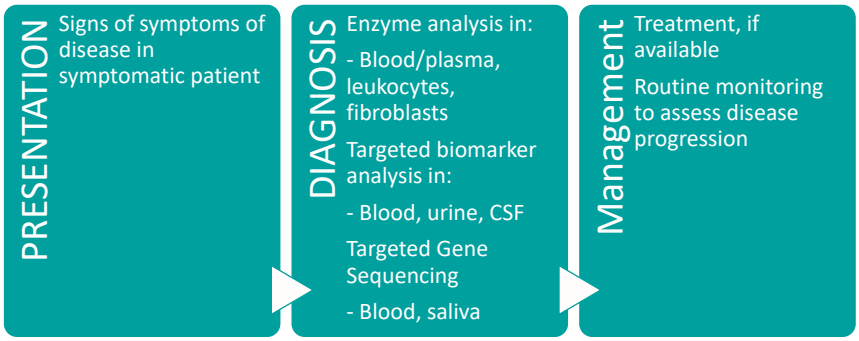
Diagnostic advances

- Traditional LSD workup



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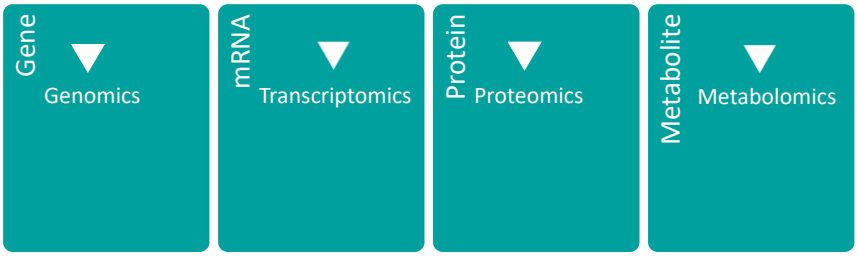
Diagnostic/monitoring advances

- New frontiers: starting to use 'omic' technologies in work up and care of LSD patients



- Genomics: despite some limitations, starting to be used as first-line for diagnosis
- Metabolomics: can be used to identify new potential biomarkers for disease
  - Biomarkers are useful in diagnosis and monitoring disease progression
- These 'omic' technologies are contributing to the growing field of precision medicine

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Lysosomal Storage Diseases

- Many of the themes for emerging diagnostics/treatments for Pompe disease are present in other LSDs as well
  - Additional LSDs on newborn screen, including some mucopolysaccharidosis (MPS) disorders
- Enzyme replacement therapy, substrate reduction therapy etc. available for multiple LSDs
- Active gene therapy clinical trials in multiple LSDs

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Resources for support

DukeHealth

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Resources

- Acid Maltase Deficiency Association (AMDA)
- Pompe Alliance
- United Pompe Foundation (UPF)
- NORD (info on rare disease in general, sometimes financial support)
- Numerous social media/Facebook groups (Hope Travels, Cure Pompe, Duke Pompe Disease Clinical and Research Program)

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Patient and caregiver involvement

- Beyond the physical aspects of the disease, it is important to assess the **psychological and emotional impact** of disease progression on patients
  - Health-related quality-of-life measures:
    - Short-Form-36 (SF-36) health survey
    - Rash-Built Pompe-Specific Activity (R-PAct) survey
    - Rotterdam Handicap Scale (RHS)
    - Fatigue Severity Scale (FSS)
    - Pain Severity Scale (PSS)

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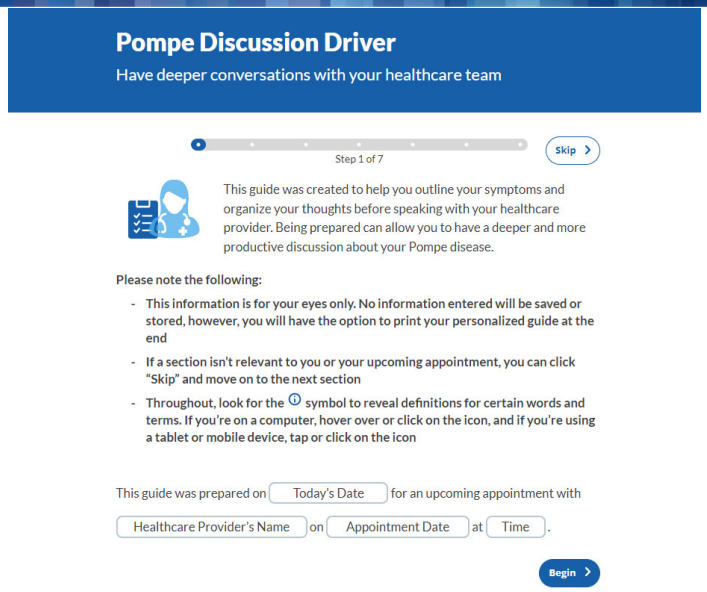
Pompe Discussion Driver



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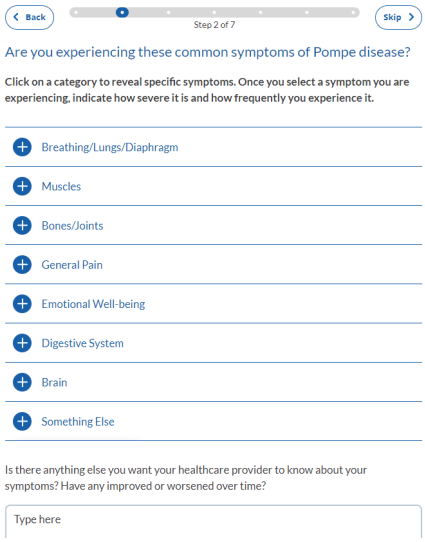

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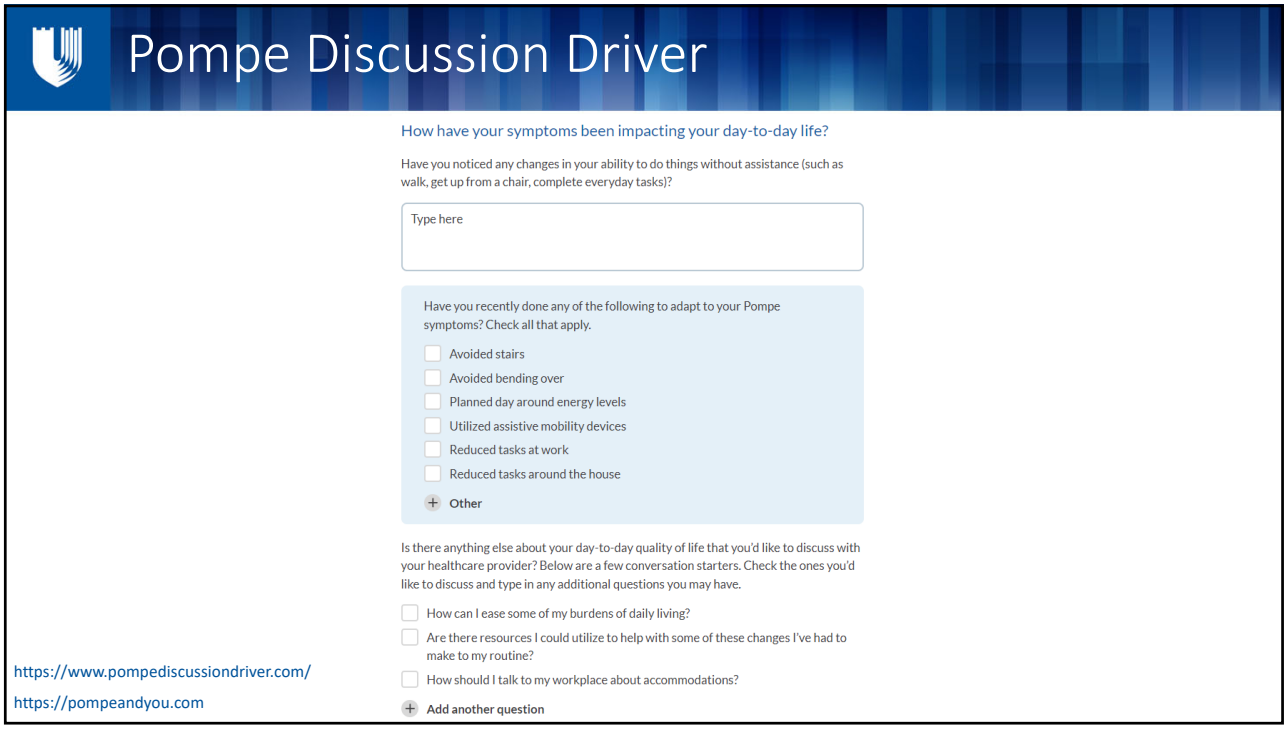
Pompe Discussion Driver
How have your symptoms been impacting your day-to-day life?
Have you noticed any changes in your ability to do things without assistance (such as walk, get up from a chair, complete everyday tasks)?
Type here
Have you recently done any of the following to adapt to your Pompe symptoms? Check all that apply.
Avoided stairs
Avoided bending over
Planned day around energy levels
Utilized assistive mobility devices
Reduced tasks at work
Reduced tasks around the house
Other
Is there anything else about your day-to-day quality of life that you'd like to discuss with your healthcare provider? Below are a few conversation starters. Check the ones you'd like to discuss and type in any additional questions you may have.
How can I ease some of my burdens of daily living?
Are there resources I could utilize to help with some of these changes I've had to make to my routine?
How should I talk to my workplace about accommodations?
Add another question
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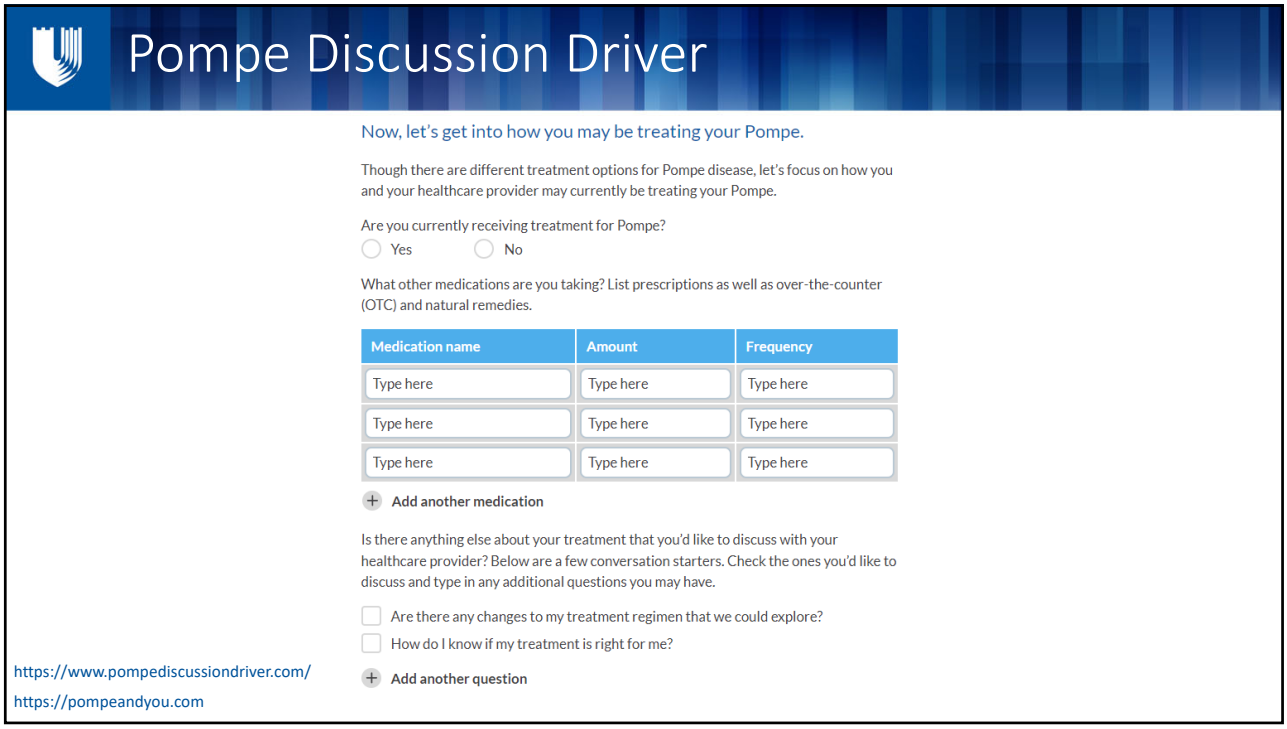
Pompe Discussion Driver
Now, let's get into how you may be treating your Pompe.
Though there are different treatment options for Pompe disease, let's focus on how you and your healthcare provider may currently be treating your Pompe.
Are you currently receiving treatment for Pompe?
Yes
No
What other medications are you taking? List prescriptions as well as over-the-counter (OTC) and natural remedies.
Medication name
Amount
Frequency
Type here
Add another medication
Is there anything else about your treatment that you'd like to discuss with your healthcare provider? Below are a few conversation starters. Check the ones you'd like to discuss and type in any additional questions you may have.
Are there any changes to my treatment regimen that we could explore?
How do I know if my treatment is right for me?
Add another question
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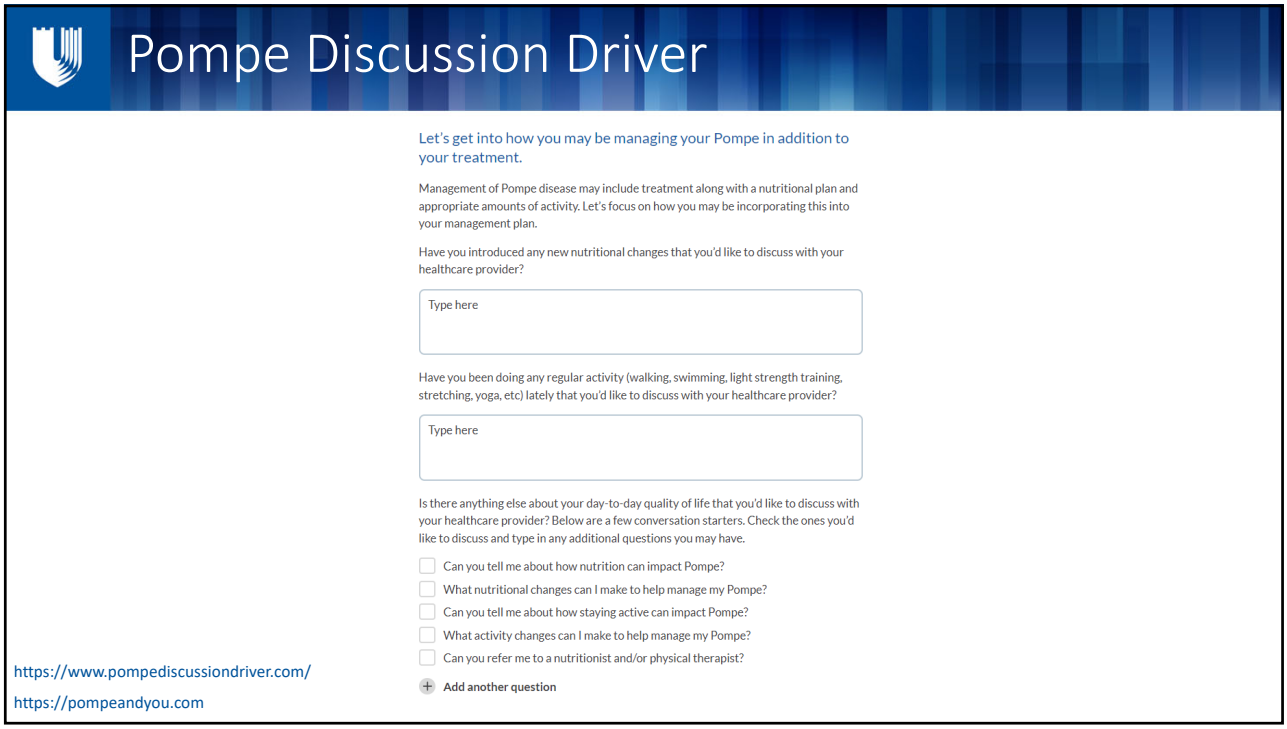
Pompe Discussion Driver
Let's get into how you may be managing your Pompe in addition to your treatment.
Management of Pompe disease may include treatment along with a nutritional plan and appropriate amounts of activity. Let's focus on how you may be incorporating this into your management plan.
Have you introduced any new nutritional changes that you'd like to discuss with your healthcare provider?
Type here
Have you been doing any regular activity (walking, swimming, light strength training, stretching, yoga, etc) lately that you'd like to discuss with your healthcare provider?
Type here
Is there anything else about your day-to-day quality of life that you'd like to discuss with your healthcare provider? Below are a few conversation starters. Check the ones you'd like to discuss and type in any additional questions you may have.
Can you tell me about how nutrition can impact Pompe?
What nutritional changes can I make to help manage my Pompe?
Can you tell me about how staying active can impact Pompe?
What activity changes can I make to help manage my Pompe?
Can you refer me to a nutritionist and/or physical therapist?
Add another question
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Pompe Discussion Driver
Let's review your tests and appointments.
Because Pompe is a progressive disease, guidelines recommend regular monitoring.
Select the tests below that you'd like to discuss with your healthcare provider. You can choose whether you'd like to discuss your last results, schedule your next test, or both.
Forced vital capacity (FVC)
Six-minute walk test (6MWT)
HEX4
Creatine Kinase (CK)
Muscle ultrasound
Dynamometer
Antibody testing
Liver enzyme testing
Metabolic panel
Other
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Pompe Discussion Driver

Let's wrap this up by setting some appointment goals.

Remember that your appointment is your time to provide and receive crucial information about your health. Setting goals beforehand can help you take full advantage of the time you have with your healthcare provider.

What do you want to accomplish at your next appointment? Check all that apply.

- ☐ Express how my symptoms affect my daily life
- ☐ Explore latest treatment options
- ☐ Learn about Pompe monitoring/management
- ☐ Understand my test results
- ☐ Learn about Pompe disease progression
- ☐ Learn about how nutrition impacts Pompe
- ☐ Learn about how staying active impacts Pompe
- ☐ Discuss how Pompe is impacting my emotional well-being
- ☐ Plan for life events that could potentially be impacted by my Pompe
- ⊕ Add another goal

Do you have any other questions for your healthcare provider?

Type here

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Learning objectives: Summary

- Recognizing signs and symptoms of LSDs early
  - Working quickly with local subspecialists to send appropriate biochemical and genetic testing; making a referral, if most appropriate
- Multi-system health care
  - Requires good communication between primary care, subspecialists, and care coordination teams
- Emerging therapeutic products
  - New FDA approvals and multiple clinical trials
- Patient/Caregiver engagement in health
  - Support groups, online tools and resources to keep track of health, clinicaltrials.gov

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Acknowledgements

- Duke Pompe Clinical and Research Team
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- Our patients and their families

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