ECHO Diabetes

Covid-19 Related Diabetes

Can COVID-19 Cause Diabetes?

August 2020

August 2020 ECHO Diabetes – objectives & case

- Present on the "chatter" regarding the possibility that COVID-19 directly results in new-onset diabetes - "***Covid-19-Related Diabetes***"
  - Present other possibilities and opinions
  - Review of some *published* articles on COVID-19 and diabetes

- Case: 31 yo "homeless" male admitted with COVID-19 & DKA – no past hx of diabetes
  - Jamaican heritage, in CO from Florida
  - Prolonged hospitalization – released to local public health & the local Travelodge for completion of required isolation – called to help with diabetes management
  - Able to get flight home to Florida following isolation completion
- What type of diabetes?
  - Type 1 (autoimmune diabetes) – new onset presenting as DKA due to stress of severe illness
  - Type 2 – previously undiagnosed with DKA due to stress of severe illness
  - "Covid-19 Diabetes"

New England Journal of Medicine

- There is a bidirectional relationship between Covid-19 and diabetes.
  - On the one hand, diabetes is associated with an increased risk of severe Covid-19
    - **(DM⬜ Severe COVID-19)**

  - On the other hand, new-onset diabetes and severe metabolic complications of preexisting diabetes, including ***diabetic ketoacidosis and hyperosmolarity*** for which ***exceptionally high doses of insulin*** are warranted, have been observed in patients with Covid-19
    - **(COVID-19⬜ Severe Diabetes complications (hyperglycemic emergencies)**

DM ☐ Severe COVID-19

Diabetes is a major contributor to disease severity and mortality in patients with COVID-19; ~3-X increase in risk of death during hospital admission for patients with diabetes

Is it "Diabetes" per se or "Hyperglycemia"?

Hyperglycemia Predicts COVID-19 Death & Complications
Diabetologia July 2020

- The study involved consecutive patients with COVID-19 and definitive 28-day outcome **and fasting blood glucose measurement on admission** to two Wuhan-area hospitals between January 24 to February 10, 2020. - A total of 605 patients *did not have a previous diabetes diagnosis*.
  - 54.4%, had a fasting blood glucose below 110.0 mg/dL
  - 16.5% had a fasting blood glucose of 110-125 mg/dL considered the prediabetes range
  - 29.1% had a fasting blood glucose of 126 mg/dL or above, the cutoff for diabetes.
- Compared to patients with normal glucose (< 110),
  - 28-day **mortality** was twice as high (HR, 2.06) for those with FBS of 110-125 and more than threefold higher for ≥ 126 (HR, 3.54)
  - **Complications** were more than twice as common in patients with FBS of 110-125 (HR, 2.61) and four times more common (HR, 3.99) among those with a fasting blood glucose ≥ 126

Hyperglycemia Predicts COVID-19 Death & Complications continued

- Although A1c data weren't analyzed, the population is believed to *include both* individuals with **pre-existing but undiagnosed diabetes** and **those without diabetes who have acute "stress hyperglycemia**."

- "***Glycemic testing and control*** *should be recommended for* **all COVID-19 patients** *even if they do not have pre-existing diabetes, as most COVID-19 patients are prone to glucose metabolic disorders,"* Wang and colleagues note.

  - *"Addressing elevated fasting blood glucose at an early stage can help clinicians better manage the condition and lower the mortality risk of COVID-19 patients,"*

The impact of hyperglycemia on outcomes of COVID-19 - Prim Care Diabetes. 2020 Jul 3
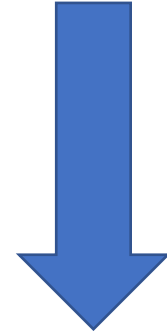
- Inpatient hyperglycemia contributes to a significant increase in morbidity and mortality while improving glycemic control correlates with better outcomes in patients with diabetes and COVID-19.
  - Among 7337 confirmed COVID-19 cases in China, diabetics with better glucose control (**70−180 mg/dL**) had **lower mortality rate** than **diabetics with poor control (>180 mg/dL)**.
    - Patients from the well-controlled group **also had lower inflammatory and coagulation markers** (CRP, procalcitonin, d-dimers), **required significantly less treatment** (antivirals, antibiotics, antifungals, systemic corticosteroids, immunoglobin and vasoactive drugs) and had **less need for oxygen supplementation as well as invasive and non-invasive ventilation**.
  - A retrospective study with 1122 patients in 88 U.S. hospitals showed that patients with COVID-19 and **diabetes and/or uncontrolled hyperglycemia** had a **longer length of hospital stay and markedly higher mortality** than patients without diabetes and/or uncontrolled hyperglycemia.
    - In a subset analysis of **patients without evidence of diabetes prior to admission who developed hyperglycemia in hospital, mortality was 7-fold greater**, thus raising the possibility that acute **hyperglycemia is an independent risk factor for mortality** in COVID-19.
  - Hyperglycemia at admission has also been associated with worse prognosis, **while optimal glycemic control** during hospitalization is associated with **a significant reduction of inflammatory cytokines, pro-coagulative status and risk of severe disease and death in patients with COVID-19.**

Summary regarding impact of hyperglycemia

- No diabetes – no hyperglycemia

- Diabetes – controlled hyperglycemia (110-180, 140-180)

- Diabetes – hyperglycemia (>180)

- No Diabetes – hyperglycemia

- Both Diabetes and Hyperglycemia impact outcomes with COVID-19
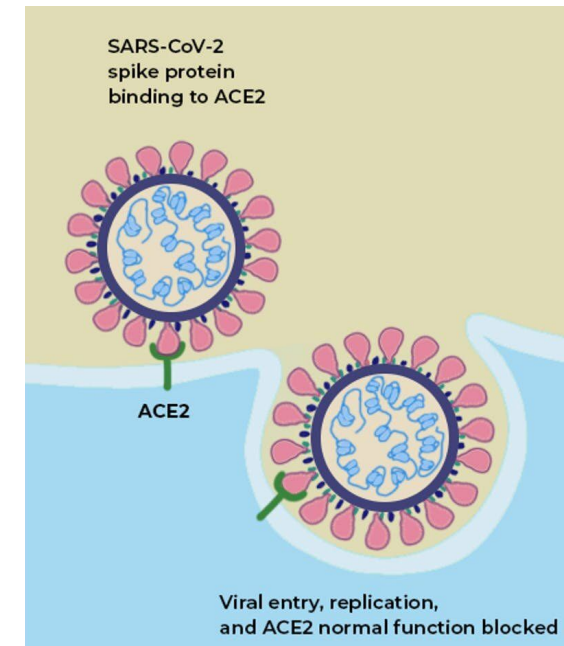
Worse Outcomes

Mechanisms by which Hyperglycemia contributes to a Worse Outcome with COVID-19
Antonia Ceriello MD; Diabetes Research and Clinical Practice

- "An acute increase in glycemia is accompanied by a **huge increase** in **inflammatory mediators**" that contribute to **cytokine storm**

- Hyperglycemia contributes to **greater glycosylation of ACE2** (the enzyme used by the virus to access cells) and this glycosylation is needed for the virus to link to the cellular receptor for intrusion **into the body cell** (in addition to an impaired immune response to the infection)

SARS-CoV-2 spike protein binding to ACE2

ACE2

Viral entry, replication, and ACE2 normal function blocked

Preadmission Diabetes-Specific Risk Factors for Mortality in Hospitalized Patients With Diabetes and Coronavirus Disease 2019

Shivani Agarwal, Clyde Schechter, Will Southern, Jill P. Crandall, Yaron Tomer
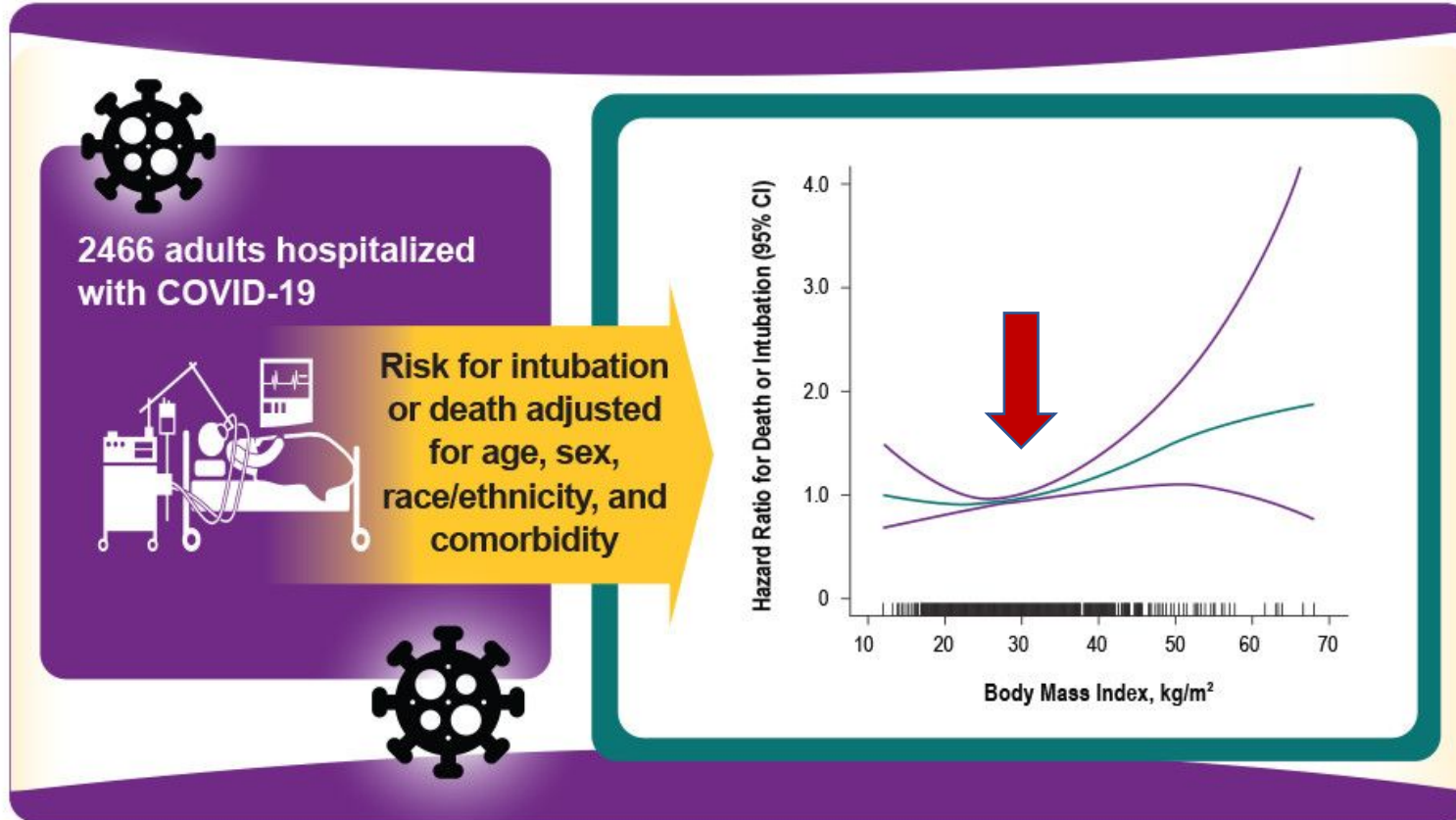
RESULTS:

- Included 1,126 hospitalized patients with diabetes and COVID-19 for analysis, among whom mean age was 68 years, 50% were male, 75% were black, mean BMI was 30 kg/m2, 98% had type 2 diabetes, mean HbA1c was 7.5%, and 33.1% died.

- *[preadmission] HbA1c levels were not associated with mortality* in unadjusted or adjusted analyses, but an **outpatient regimen with any insulin treatment was strongly predictive.**
    - Additionally, age, sex, and BMI interacted such that in all age categories, **mortality was higher with increasing BMI i**n males compared with females.

CONCLUSIONS

- In this large U.S. cohort of hospitalized patients with diabetes and COVID-19, **insulin treatment as a possible proxy for diabetes duration** and **obesity** *rather than long-term glycemic control were predictive of mortality.*
    - Further investigation of underlying mechanisms of mortality and inpatient glycemic control is needed.

Another study showed higher risk of severe illness in PWD with micro or macro-vascular complications

Is obesity associated with poor outcomes of COVID-19?

2466 adults hospitalized with COVID-19

Risk for intubation or death adjusted for age, sex, race/ethnicity, and comorbidity

Hazard Ratio for Death or Intubation (95% CI)

Body Mass Index, kg/m²

Obesity was consistently associated with higher risk for adverse outcome among patients younger than 65 years; this was not the case among those aged 65 years or older. (independent of several comorbid conditions, including diabetes and hypertension) (further increased risk if both diabetes & obesity)

patients with a BMI of 40 kg/m2 or greater are at **high risk** for poor outcomes from COVID-19 and should therefore consider prolonged social distancing

Association of Visceral Fat With the Need for Intensive Care in COVID-19 Patients – Aug 9, 2020 Metabolism - Clinical and Experimental

- This exploratory study of 150 patients with COVID-19 (mean age, 64 ± 16 years) explored the relationship between **visceral fat (VAT)** and the **need for intensive care.**
  - Chest CT scans were used to score the severity of interstitial pneumonia (and VAT)
- Factors found to have an independent association with intensive care need were lung severity score and VAT.

COVID-19 ☐ Severe Diabetes complications (hyperglycemic emergencies)

or New Onset Diabetes??

COVID-19 may trigger new diabetes
June 12, 2020, King's College London

- Letter / alert from several experts:

- Emerging evidence suggests that COVID-19 may actually trigger
  - the onset of diabetes in healthy people
  - severe complications of pre-existing diabetes

The Effect of Covid-19 on Diabetes

- Is there a potential **diabetogenic effect** of Covid-19, ***beyond the well-recognized stress response*** associated with severe illness?

- Will the alterations of glucose metabolism that occur with a sudden onset in severe Covid-19 **persist or remit** when the infection resolves?

- How frequent is the phenomenon of **new-onset diabetes**?
  - Is this classic type 1 or type 2 diabetes or a new type of diabetes?
  - Do these patients remain at higher risk for diabetes or diabetic ketoacidosis?

- In patients with preexisting diabetes, does Covid-19 **change the underlying pathophysiology** and the natural history of the disease?

Answering these questions in order to inform the immediate clinical care, follow-up, and monitoring of affected patients is a priority.

CoviDIAB - Covid-19-related diabetes

- ***the CoviDIAB Project***: an international group of leading diabetes researchers have established a global registry of patients with Covid-19–related diabetes ([covidiab.e-dendrite.com. opens in new tab](covidiab.e-dendrite.com)).

- Covid-19–related diabetes:
  - The researchers hope to use the registry cases to understand whether
    - SARS-CoV-2 can induce type 1 diabetes or a new form of the disease.
    - the sudden-onset diabetes becomes permanent in people who've had COVID-19.
    - the virus can tip people who were already on their way to developing type 2 diabetes into a diabetic state.

Protracted ketonaemia in hyperglycaemic emergencies in COVID-19:a retrospective case series

- Diabetic Keto-Acidosis (DKA) and hyperosmolar hyperglycemic state (HHS) are hyperglycemic emergencies associated with substantial mortality
  - Retrospective analysis of a case series of hyperglycemic emergencies hospitalized during the COVID-19 outbreak in the UK.
  - Results show that COVID-19 is associated with **hyperglycemic emergencies in COVID-19 with overrepresentation of type 2 diabetes in patients presenting with DKA and long-lasting ketosis.**

- 35 patients with COVID-19, presenting with
  - DKA (31·4%), (pH 6.9-7.3) – 18.2% T1DM, 81.8% T2DM
  - mixed DKA and HHS (37·1%) – 2 of these patients on SGT2i med prior to admission
  - HHS (5·7%)
  - hyperglycemic ketosis (25·7%) (no acidosis –pH 7.4-7.5 but + blood ketones)

  - Type 2 diabetes was prevalent in 28 (80%), whereas 2 (5·7%) of 35 patients were new presentation of diabetes (all 5 patients with T1DM presented with DKA)

Protracted ketonaemia in hyperglycaemic emergencies in COVID-19:a retrospective case series
Lancet Diabetes July 1, 2020

- This study shows striking **type 2 disease overrepresentation in those presenting with DKA**,
    - suggesting acute insulinopenia in patients with COVID-19 and with type 2 diabetes, which persisted up until the time of discharge in 30% of patients previously not insulin-treated.
- Patients **developed protracted ketonemia and ketoacidosis**, with median time to ketone resolution in DKA of approximately **35 h**;
    - whereas in non-COVID-19 DKA cases the median duration of ketoacidosis is ~ **12 h**.
- **Presence of ketosis and ketoacidosis** in patients with COVID-19 infection was **associated with length of hospital admission and overall mortality.**

- Emerging reports suggest substantial insulin resistance and possibly relative insulinopenia in severe COVID-19 *disproportionate to that seen in critical illness caused by other conditions*, which might have contributed to the metabolic decompensation.

COVID-19 in people with diabetes: understanding the reasons for worse outcomes

- People with diabetes have a worse prognosis from COVID-19 that is multifactorial* (age, co-morbidities, obesity, pro-inflammatory & pro-coagulant state, etc.)

- But also "**coronavirus 2 infection itself** might represent a ***worsening factor*** for people with diabetes, as it can precipitate acute metabolic complications through ***direct negative effects on β-cell function.***"

- These effects on β-cell function might also cause
  - diabetic ketoacidosis in individuals with diabetes
  - hyperglycemia at hospital admission in individuals with unknown history of diabetes
  - potentially new-onset diabetes.

Covid-19 Related Diabetes

- Is Covid-19-Related Diabetes
  - pre-existing undiagnosed prediabetes/diabetes being identified for the first time
    - 21.4% of people with diabetes are undiagnosed (7.3 million people)
    - ~35% of US adults have prediabetes (~88 million)
      - ~85% are unaware of their prediabetes status
  - stress hyperglycemia
    - also called stress diabetes or diabetes of injury - a transient elevation of the blood glucose due to the stress of illness.
      - It usually resolves spontaneously but must be distinguished from various forms of diabetes mellitus – traditionally 1/3 of patients pre-existing undiagnosed diabetes, 1/3 pre-existing undiagnosed pre-diabetes; 1/3 of patients no pre-existing dysglycemia
  - something more specific to effects of COVID-19

Newly diagnosed diabetes mellitus, DKA and COVID-19: causality or coincidence? – A report of 3 cases

- Previous coronavirus outbreak such as SARS-CoV-1 can cause new-onset diabetes mellitus (DM).

- Article described three patients who had newly diagnosed DM associated with COVID-19 – authors conclude:
    - ***COVID-19 likely unmasked existing DM** by aggravating its metabolic complications *rather than causing the new-onset DM in these patients.*
    - However, more research is needed to evaluate if there is a casualty relationship between the development of DM, DKA, and COVID-19.

Pre-existing but Undiagnosed Pre-diabetes or Diabetes Identified due to Admission

- "Does COVID-19 really cause high blood sugars or were their blood sugars high beforehand and it was simply finally diagnosed?" asked David Nathan (MGH) for Healthline interview/article
  - May be one of 7.3+ million people in the United States with **undiagnosed diabetes**
    - "One way to determine this would be to look at their HbA1c levels at the time of diagnosis."
      - If a person's A1C level was above 6 or 7 percent, they likely had been in the process of developing type 2 diabetes prior to developing COVID-19.
  - "The stress associated with COVID-19 is pretty profound and people are pretty damn sick by the time they're being hospitalized," - This physical trauma to the body could easily lead to **stress-induced hyperglycemia**

… Identifying those not previously identified because they are admitted & get lab tests

COVID-19 and type 1 diabetes

- "There are several viruses that have been implicated directly with the full onset of type 1 diabetes," explains Dr. David Nathan "…but research has shown the disease *was developing long before* the symptoms develop"
    - … referring to the process of the immune system starting to attack and destroy beta-cells responsible for producing insulin - **autoantibodies** in people with type 1 diabetes often **develop years prior to the full onset** of the disease.
    - the **stress of a virus** such as the flu or COVID-19 is simply **the final catalyst** that creates enough stress that **insulin production finally declines severely enough to result in diabetic-related ketones** and thus the common symptoms of type 1 diabetes.
- "It's **associated with the onset, but it's not the cause**," said Nathan. "That's a critical detail to understand."

But others are concerned that COVID might be rapidly shutting down or destroying beta cells ….

Combination of pre-existing(diagnosed or undiagnosed) Pre-DM /DM & Stress

- People with **prediabetes or diabetes** who have ***any added stress (such as a virus) can tax the metabolic system***, which could lead to worsening hyperglycemia and the classic symptoms of the onset of diabetes
  - Classic symptoms: the three Ps of diabetes are polyuria, polydipsia, and polyphagia - increased urination, increased thirst, and increased appetite.

- The virus could trigger an ***extreme inflammatory state***,
  - which would impair the ability of the pancreas to sense glucose and release insulin (**decreased insulin secretion**) and dampen the ability of the liver and muscles to detect Insulin (**increased insulin resistance**) ⬜ this could **trigger diabetes or worsening of pre-existing prediabetes/diabetes**

Shane Grey, an immunologist at the Garvan Institute of Medical Research in Sydney, Australia.

Stress Hyperglycemia
2015 – practical (& brief) overview

https://www.todayshospitalist.com/new-warnings-on-stress-hyperglycemia/

- Hyperglycemia in hospitalized and/or perioperative patients is associated with higher complication rates among "**nondiabetics**" than people with diagnosed diabetes
  - acute hyperglycemia is a marker of severity of illness
  - often not treated if no underlying diagnosis of diabetes (resulting in worse outcomes)

- Critical to follow-up after discharge
  - ~1/3 previously undiagnosed diabetes
  - ~1/3 previously undiagnosed pre-diabetes
  - ~1/3 no underlying glycemic abnormalities – may remit as stress reduced

Does Covid-19 directly cause Diabetes?
SARS-CoV-2 might cause or worsen diabetes- Cell Metab –June 2020

- A handful of people have *spontaneously developed diabetes after being infected with SARS-CoV-2*, and dozens more people with COVID-19 have arrived in hospital with *extremely high levels of blood sugar and ketones*
    - Various viruses, including the one that causes severe acute respiratory syndrome (SARS), have been linked with **autoimmune conditions** such as type 1 diabetes.
    - Many organs involved in controlling blood sugar are rich in a protein called **ACE2**, which SARS-CoV-2 uses to **infect cells**.
        - An experimental study in miniature *lab-grown pancreases* suggests that the **virus** might trigger diabetes by **damaging the islet cells** –
        - Biologist at Weill Cornell Medicine showed that the **virus can infect the organoid's α- and β-cells**, some of which then die.
    - The virus can also induce the production of proteins known as **chemokines and cytokines**, which can **trigger** an **immune response that might also kill the cells**

The Impact of SARS-Cov-2 Virus Infection on the Endocrine System

Noel Pratheepan Somasundaram

- A study during the SARS (Co-V-1) epidemic demonstrated ACE2 expression in islet cells and a high incidence of hyperglycemia among SARS patients.
  - In a cohort of 39 **nondiabetic nonglucocorticoid-treated patients, 20 developed new-onset fasting hyperglycemia -** It was speculated that **SARS-CoV-1 may directly infect islet cells** causing their dysfunction, resulting in hyperglycemia or new-onset diabetes.
    - Pancreatic injury has been shown in some postmortem studies but not in others.
    - SARS-CoV-1 viral material was found within pancreatic cells in some, but not other postmortem studies.

- Anecdotal reports from experts caring for **COVID-19** patients note **a higher incidence of hyperglycemia, new-onset diabetes, diabetic ketoacidosis, and euglycemic ketoacidosis.**
  - Data from the current COVID-19 pandemic are limited - Thus far, no postmortem studies during the COVID-19 pandemic have reported changes in pancreatic tissues or described differences in insulin level or insulin resistance to establish a direct link between the coronavirus infection and hyperglycemia.

- Based on the experimental observations, **a paracrine loop hypothesis** has been suggested to explain this risk.
  - **SARS-CoV-2 infects** alveolar cells and **pancreatic islet cells**, causes **hyperglycemia** resulting from islet cell dysfunction
  - This hyperglycemia increases **glycosylation of ACE2 and viral spike proteins facilitating viral entry in to host cells** and thus setting up a vicious cycle.

- *Irrespective of the cause, hyperglycemia predicts a poor prognosis and warrants prompt recognition and correction.*

Summary of info to date

- Hyperglycemia and hyperglycemic emergencies worsen the outcomes of COVID-19 – reduce survival –
  - regardless of the type of diabetes or pre-existing diabetes
- Patients with COVID-19 and controlled glycemia have better outcomes

- More studies are needed to determine if COVID-19 uniquely impacts the development or worsening of diabetes beyond the expected effects of stress and inflammation (e.g. by infecting islet cells or triggering autoimmune or immune destruction of beta cells)
- All patients with COVID-19 should have glucose measured and monitored – and treated if elevated regardless of existing diagnosis of diabetes or pre-diabetes
  - Ongoing follow-up critical

- Best option is preventing infection in the first place

COVID-19: 6 key points to share with patients

- *"It is an interesting situation in that everyone's behavior affects everyone else. It's a time where the idea of shared responsibility has to be central—everyone has to do their part because the whole ship will sink otherwise."* – Dr. Preeti Malani, associate editor JAMA – offered 6 key points to help inform and calm patients regarding COVID-19

- **Call before coming into the office**
  - patients may or may not even need to be seen, depending on the history and potential exposures and how they are feeling -Whether communicating through a patient portal or on-call nurse, patients can often get effective advice before making an in-person visit.

- **It's not a good time to visit anywhere**
  - The U.S. State Department and the Centers for Disease Control and Prevention (CDC) have issued warnings and recommend avoiding nonessential travel

6 key points to share with patients continued

- **Practice basic prevention**
  - It remains more important than ever for patients—and everyone in general—to follow time-tested preventive habits: **keeping hands clean**, **maintaining physical distance**, **do not be around people if you have symptoms and cover coughs and sneezes.**

- **Everyone should wear a mask**
  - A significant amount of transmission occurs from individuals who are either minimally symptomatic or asymptomatic – even if outdoors if unable to socially distance – **Everyone should wear "a comfortable cloth face covering that fits well and doesn't fall down, to protect everybody** and to allow us to move forward with some type of normalcy."

- **Risk remains high in the U.S.**
  - "The risk varies depending on where you are, but **the risk is not zero anywhere** - We have to all practice prevention whenever we're outside our homes and **to limit how much we're leaving our homes, particularly those individuals who are at higher risk for complications** - any interaction with people outside your household should be limited to small groups."

- **If you visited a hot spot, heed the signs**
  - While it is about if someone has visited a hot spot, it's also "if you've just been out and about" - This is particularly true for younger adults and kids who have a hard time not interacting with other people - some people are going to be at higher risk because they're engaging in parties and **gatherings where physical distancing isn't happening.** "We all need to heed the signs because **everyone is at risk who is outside their home.**"

American Diabetes Association, Harvard Medical School issue
COVID-19 prevention guidelines for people with diabetes

- The recommendations explain how to
  - establish and maintain strict personal hygiene,
  - minimize physical interaction with others,
  - minimize risk when out in public,
  - make work as safe as possible,
  - set yourself up for success with diabetes management,
  - maximize your baseline physical and mental health,
  - if you get sick to get treated quickly.

- **Prevention**
  - **Reduce exposure risk**
  - **Prevent severe hyperglycemia if infected**

American Diabetes Association, Harvard Medical School issue
COVID-19 prevention guidelines for people with diabetes

- **Establish and maintain strict personal hygiene.**
  - Wash hands every time you contact an out-of-home item or place.
  - Regularly disinfect high-touch surfaces in your home.
  - Avoid touching your face.
  - Cough or sneeze into your elbow or a handkerchief.
  - Act as if you have COVID and could pass it on

- **Minimize physical interaction with others.**
  - Minimize contact with individuals outside your household.
  - Secure sufficient food, supplies, and medication to minimize trip frequency as your budget allows - Get them delivered if you can.
  - Seek routine medical care from home: utilize telehealth and mail-order pharmacy options.

- **Minimize risk when out in public.**
  - Maintain a distance of at least 2 meters / 6 feet from others.
  - Wear a cloth mask or face covering.
  - Adjust schedule to avoid busy times in public places.
  - Take advantage of dedicated shopping times for vulnerable individuals if available.

- **Make work as safe as possible.**
  - Work from home as much as you can.
  - Look into modifications in work procedures to keep 2 meters / 6 feet distance from others.
  - Adjust your schedule to avoid high-traffic times.
  - As physical distance rules are lifted, advocate for flexible work options for high-risk individuals.
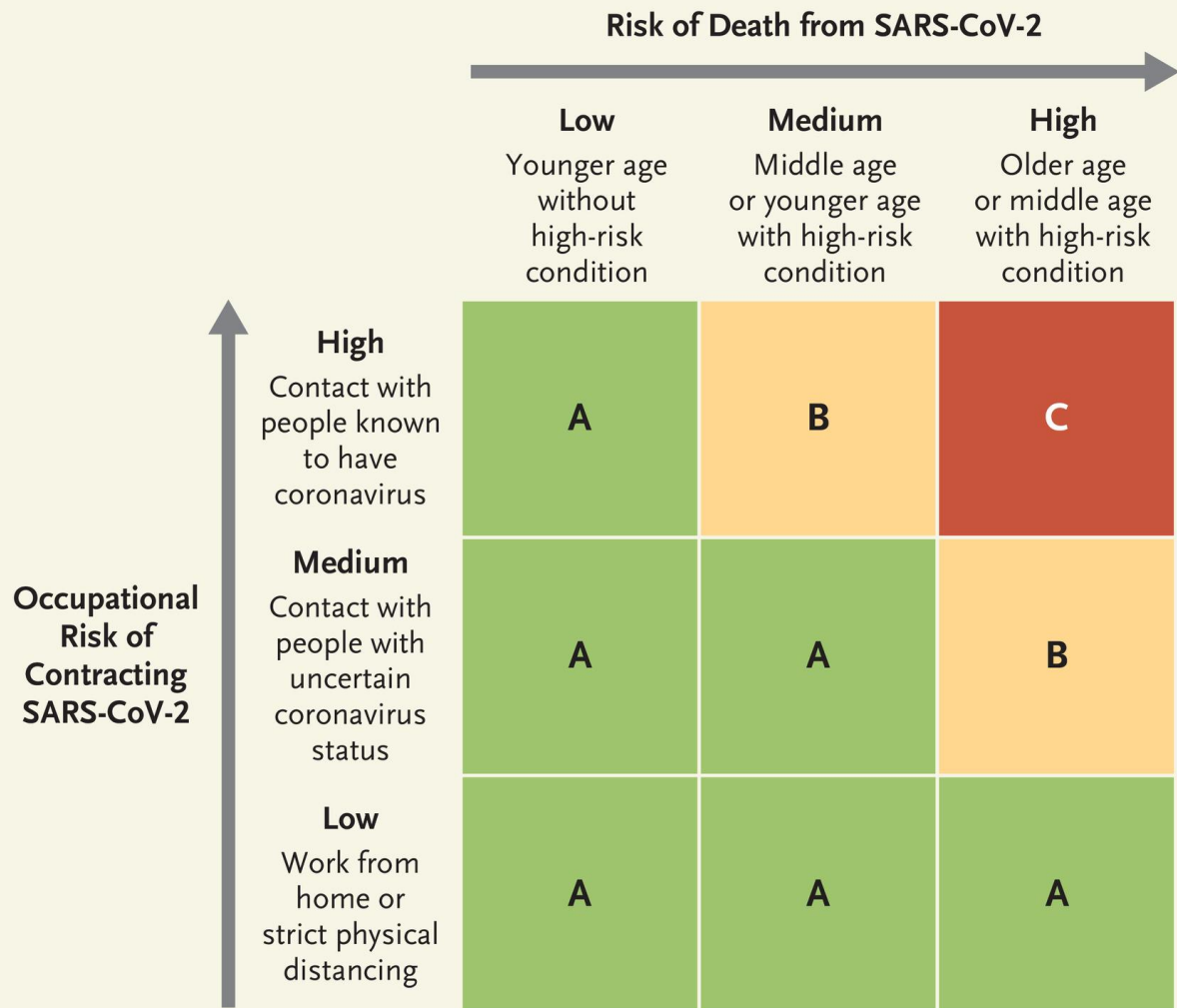
American Diabetes Association, Harvard Medical School issue
COVID-19 prevention guidelines for people with diabetes

- **Maximize baseline physical and mental health.**
  - If you smoke or vape, stop now.
  - Prioritize rest, hydration, nutrition, physical activity, and virtually socializing with others.
  - Exercise inside or in isolated areas.
  - If you are struggling with mental health, seek online help.

- **Set yourself up for success with diabetes management.**
  - Test blood sugar levels more often; your body may be reacting differently under these new circumstances.
  - Familiarize yourself with how to check for ketones. Check for ketones regularly, regardless of blood sugar levels.
  - Secure a sufficient amount of supplies, including ketone strips and severe hypoglycemia treatment (glucagon).
  - Maintain a routine of physical movement and blood sugar friendly eating.
  - Contact your doctor or health professionals by phone / telehealth if possible, for diabetes management questions and concerns.

- **If you get sick, get treated quickly.**
  - Measure temperature daily with a thermometer and take heart rate with a watch. Track any changes.
  - Never stop taking insulin or other medications, even when you become sick.
  - Discuss insulin dosage changes with a doctor.
  - Know the warning signs of DKA and seek immediate medical attention for symptoms including fruity smelling breath, vomiting, weight loss, dehydration, confusion, and hyperventilation.

"Is It Safe for Me to Go to Work?" Risk Stratification for Workers during the Covid-19 Pandemic
Marc R. Larochelle, M.D., M.P.H.

- https://www.nejm.org/doi/full/10.1056/NEJMp2013413

- Though data on occupational risk are limited, the Occupational Safety and Health Administration has published guidance and proposed a scheme for classifying the risk of SARS-CoV-2 infection as high, medium, or low based on potential contact with persons who may or do have the virus (www.osha.gov/Publications/OSHA3990.pdf).

Risk of Death from SARS-CoV-2

	Low Younger age without high-risk condition	**Medium** Middle age or younger age with high-risk condition	**High** Older age or middle age with high-risk condition
High Contact with people known to have coronavirus	A	B	C
Medium Contact with people with uncertain coronavirus status	A	A	B
Low Work from home or strict physical distancing	A	A	A

Occupational Risk of Contracting SARS-CoV-2

A: Instruct the patient to wear a mask outside the home, practice recommended hand hygiene, and use PPE as directed.

B: Discuss individual risks and opportunities to mitigate exposure and to consider stopping work. Counsel patient to take all precautions outlined in A.

C: Counsel patient on high risk of continuing to work and to consider stopping work. Counsel patient to take all precautions outlined in A.

"I Want to Help my People I Want to Help my People"

A Poem by Lakota & Dakota Sioux Community Health Representatives

"I am a representative of my community."

"I am a representative for health." "I believe in my Creator." "I see it as a calling." "This is what I'm supposed to do."

"I want to help my people." "My own life has to have balance, or nobody will believe me." "I'm not better than anybody else." "I ask for forgiveness." "I have to have a clean frame of mind." "I pray to say the right things."

"I want to help my people." "It's this idea of helping people." "People trust me." "They come to me in need." "I'm there for everyone." "We're the "in-between" people."

"I want to help my people." "The eagle sees everything that's going on." "Our ears are always open."

"Like bees, we're busy, trying to make things right." "Sometimes we see things that make us sad." "I can be fierce like a bear …trying to protect."

"I want to help my people." "We have feelings, too." "I wish they knew how much we care." "I say, `We're here for you but please meet us halfway'." "Some people thank us from the heart." "Our elders -- they understand."

"I want to help my people." "From the job came a concern for my people."

"I didn't know my people were so sickly with diabetes." "People on dialysis talk to me -- `If I had only known….'"

"We've got to think about our children and grandchildren." "We need prevention here." "I want to help my people." "We try again and again – then there's a little change." "She gets outside and starts moving around." "Just yesterday, he got off insulin and onto a pill." "We did it! She switched to diet pop!" "That's rewarding…rewarding….rewarding…"

"I want to help my people." "We should tell our youth, "No, diabetes doesn't have to happen to you." We know how to prevent these long-term illnesses. Let's commit again to our traditional ways of living, A life of balance, of people walking together on the same path. Coming together in a good way. "I want to help my people." "I think of all the things I want for my community." "I think of the animals that fly, swim - that survive…"

"I want our people to stand and be proud like the eagle." "I think of the patience of the turtle." "I remember of the strength of the buffalo." "I want to help my people."