Influenza and Diabetes

Burden of Disease

People with diabetes are at high risk of complications from influenza.

Diabetes, even if well managed, can make it harder for the immune system to fight infections, so people with diabetes are at risk of more serious complications from influenza compared to people without diabetes.[1]

Serious flu related complications include:

- pneumonia
- myocarditis (inflammation of the heart)
- encephalitis (inflammation of the brain)
- myositis and rhabdomyolysis (inflammation of muscle tissue)
- sepsis triggered by a severe inflammatory response in the body and
- multi-organ shutdown (e.g. respiratory or kidney failure)

Influenza can make diabetes worse

Influenza may increase cortisol and adrenaline in the body which may trigger an increase in blood glucose levels. In a person without diabetes, extra insulin is produced to counter these effects however in someone with diabetes this is not possible. People with type 1 diabetes are at particularly increased risk of developing ketoacidosis. Keto-acidosis is a life-threatening condition where the body cannot make enough insulin to counteract the increase in blood glucose.

Alternatively, some people with diabetes who contract the flu don't feel like eating and their blood sugar may be low. Due to this possible fluctuation in blood sugar levels, it is important that people with diabetes who get the flu follow the sick day guidelines for their region.

Australian Diabetes Educator Association (ADEA) Sick day guidelines for people with diabetes

https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjQm6ai_5bVAhVBwLwKHZJ4D-cQFggkMAA&url=https%3A%2F%2Fwww.adea.com.au%2Fwp-content%2Fuploads%2F2013%2F08%2FSickday_summary.pdf&usg=AFQjCNGb8b4BsAhPI9C4jSdFkNym1YNQ3g

[1] Centers for Disease Control and Prevention, Vaccine Information for adults Last accessed 20th July 2017
[2] Diabetes Australia, Influenza fact sheet accessed 20th July 2017
[3] Allard R, Leclerc P, Tremblay C, Tannenbaum TN. 2010. Diabetes and the severity of pandemic

Evidence of influenza-related hospitalisations or death

If you have diabetes, you are three times more likely to be hospitalised and three times more likely to die from the flu and its complications than other people.[2]

Pandemic influenza A(H1N1)p

Diabetes triples the risk of hospitalization after influenza A (H1N1)p and quadruples the risk of ICU admission once hospitalized.[3]

Seasonal influenza

Compared with working age adults (<65 years of age) without diabetes, those with diabetes had a 6% greater increase in all-cause hospitalisations associated with influenza.[4]

Epidemics

People with diabetes are six times more likely to be hospitalized during an influenza epidemic than those without diabetes, with the mortality varying between 5% and 15%.[5]

Benefits of influenza vaccination in people with diabetes

Immunogenicity

Can people with diabetes mount an adequate immune response to the influenza vaccine to protect them from influenza?

The results of the three studies outlined below show that people with diabetes are able to mount an adequate response to the influenza vaccine and thus the influenza vaccine may offer valid protection against influenza.

Frasca et al
Experiments were conducted using blood from 22 type 2 diabetes (T2D) patients and 65 healthy volunteers of different ages to determine their immune response. Results showed that in vivo responses, as well as B cell-specific markers, decrease by age in healthy individuals but not in T2D patients.[6] The researchers suggested that based on these results, valid protection against influenza may be achieved in young and elderly people with type 2 diabetes.

Seo et al
A randomized controlled trial was conducted at two university hospitals with 105 participants with diabetes and 108 controls. The study found that the immunogenicity profiles were similar between the two groups, except for the seroprotection rate for the A/H1N1 influenza strain, which was significantly lower in the elderly group with diabetes than in the elderly

[2] Diabetes Australia, Influenza fact sheet accessed 20th July 2017
[3] Allard R, Leclerc P, Tremblay C, Tannenbaum TN. 2010. Diabetes and the severity of pandemic influenza A (H1N1) infection. Diabetes Care 33:1491–1493.
[4] Lau D, Eurich DT, Majumdar SR, Katz A, Johnstone JA Working-age adults with diabetes experience greater susceptibility to seasonal influenza: a population based cohort study Diabetologia. 2014 Apr;57(4):690-8.
[5] Kesavadev et al Suggested use of vaccines Indian J Endocrinol Metab. 2012 Nov-Dec; 16(6): 886–893.
[6] Frasca D, Diaz A et al Young and elderly patients with type 2 diabetes have optimal B cell responses to the seasonal influenza vaccine Vaccine. 2013 Aug 2;31(35):3603-10.

without diabetes. However, in the multivariate study, long term immunogenicity was associated with age, pre-vaccination titer, regardless of diabetes status.[7]

Sheridan et al
An ongoing, prospective, observational study conducted in North Carolina, USA found that there was no significant difference in the percentage of the subjects with type 2 diabetes classified as seroprotected or a responder to the influenza vaccine compared with those without diabetes.[8]

Potential benefits of influenza vaccination preventing hospitalisation and death

The results of the study below showed that the influenza vaccine was able to reduce hospitalisations in young and elderly diabetes subjects. The influenza vaccine also provided a reduction in mortality in the elderly with diabetes.

Remschmidt et al
A meta-analysis of 1444 articles, 11 observational studies with 170,924 participants with type 1 or type 2 diabetes of all ages were included. The results showed in people with diabetes between 18-64 years of age, influenza vaccination prevented all-cause hospitalisation with pooled VE of 58% (95% CI, 6-81%) and hospitalisation due to influenza or pneumonia (VE 43% CI 28-54%).[9] In the elderly with diabetes, influenza vaccination prevented all-cause mortality (VE 38%; 95%CI 32-43%), all-cause hospitalisation (VE 23%; 95% CI, 1-40%), hospitalisation due to influenza or pneumonia (VE 45%; 95% CI 34-53%), and ILI (VE 13%; 95% CI, 10-16%. The quality of evidence was low for all of these outcomes , laboratory confirmed influenza was not reported, and there was inadequate adjustment for systematic differences between vaccine recipients and nonrecipients (referred to as “residual confounding”).

Potential benefits of influenza vaccination preventing cardiovascular events and death in people with type 2 diabetes

Vamos et al
A large, 7-year cohort study from the United Kingdom found that type 2 diabetes patients who were vaccinated had a 30% lower risk of hospitalization for stroke, a 22% lower risk for heart failure, and a 15% lower risk for pneumonia or flu, compared with their unvaccinated counterparts. Also, the vaccinated patients had a 24% lower risk of death from any cause during the flu season. Influenza vaccination was associated with lower rates of admission to hospital for acute MI, but this association was not statistically significant.[10]

Vaccination Coverage

Vaccination provides the best protection against flu.

World Health Organisation (WHO) recommends annual influenza vaccination for people with chronic medical conditions including diabetes.

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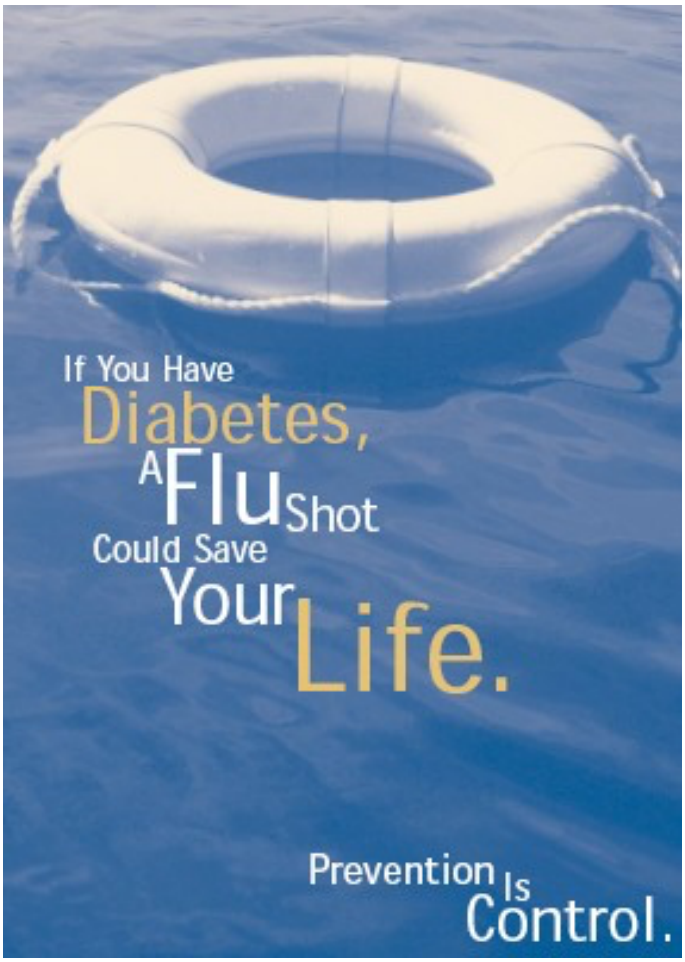
[7] Seo YB, Baek JH et al Long-term immunogenicity and safety of a conventional influenza vaccine in patients with type 2 diabetes. Clin Vaccine Immunol. 2015 Nov;22(11):1160-5.
[8] Sheridan PA, Paisch HA, Handy J et al The antibody response to influenza vaccination is not impaired in type 2 diabetics. Vaccine. 2015 Jun 26;33(29):3306-13.
[9] Remschmidt C, Wichmann O and Harder T Vaccines for the prevention of seasonal influenza in patients with diabetes: systematic review and meta-analysis BMC Med. 2015 Mar 17;13:53.
[10] Vamos EP, Pape UJ et al Effectiveness of influenza vaccine in preventing admission to hospital and death in people with type 2 diabetes CMAJ. 2016 Oct 4;188(14):E342-E351

Influenza vaccination coverage among high-risk groups varies considerably between countries around the world. Data from 11 European countries for high risk groups over 50 years of age (including people with diabetes) showed that the Netherlands had the highest vaccination coverage (≥ 75%) and Greece had the lowest (<27%).[11]



[11] Loerbroks A, Stock C, Bosch JA, Litaker DG, Apfelbacher CJ Influenza vaccination coverage among high-risk groups in 11 European countries Eur J Public Health. 2012 Aug;22(4):562-8.