



The Status of Health Services in Iraq; A Case Study of Pediatric Diabetes

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ABSTRACT

Aims Diabetes mellitus type 1 as a chronic disease represents a heavy burden on its patients and families. In the absence of health insurance in Iraq, the public sector should provide these patients with standard care to not compel them to get it from the costly, private one. This study aimed to overview the provided public service for children and young people living with diabetes in Iraq and compare it with international standards.

Instrument & Methods In this descriptive study in 2019, the opinions of physicians running public PDU in 18 provinces of Iraq were collected via an online questionnaire. The collected data were analyzed using the Survey Monkey built-in analyzing tools.

Findings The number of patients in each center ranged between 98-3000. Before transferring patients to adult services, the mean age was 16 years, ranging between 14-19 years. 78% of health care providers had no transition policy in their centers. Team composition was variable; 44% of the units had no pediatric diabetologists or trained physicians in pediatric diabetes, half had no diabetes specialist nurses or diabetes educators, 78% had no dietitians, and 94% functioned without psychologists. Basic facilities and medical supplies were limited, and not all investigations were available. The annual screening was performed in 56% of centers. Educational activities were organized only in 39% of units.

Conclusion There is a significant shortage of essential requirements for running a reasonable pediatric diabetes service with a wide variation in the provided services between the pediatric diabetes units.

Keywords Health Services; Diabetes Mellitus; Pediatrics; Iraq

CITATION LINKS

[1] Type 1 Diabetes in Children and Adolescents: A Position ... [2] Children and Adolescents: Standards of Medical ... [3] Type 1 ... [4] ISPAD clinical practice consensus ... [5] Children and adolescents: standard of medical ... [6] Diabetes (type 1 and type 2) in children ... [7] Diabetes Canada 2018 Clinical Practice ... [8] Global guideline for diabetes in childhood and ... [9] ISPAD Clinical Practice Consensus Guidelines 2018 ... [10] Prevalence of diabetes in US youth in 2009 ... [11] Incidence trends for childhood type 1 ... [12] Increasing incidence of type 1 diabetes ... [13] Incidence of diabetes in youth in the ... [14] Care of children and adolescents with type 1 diabetes: a statement of the American ... [15] Organizing person-centred care in paediatric diabetes: multidisciplinary ... [16] Diabetes ... [17] Diabetes ... [18] Oxford specialist handbook in pediatrics; Pediatric endocrinology ... [19] The World Bank Group. Physicians ... [20] Improving Glycemic Control in Children ... [21] Missed Medical Appointments and Disease ... [22] Pediatric endocrinology; A clinical ... [23] ISPAD clinical practice consensus guidelines 2018: Glycemic control ... [24] Insulin analogues in type 1 diabetes mellitus ... [25] ISPAD clinical practice consensus guidelines 2018: Insulin treatment in ... [26] Nelson textbook of ... [27] Indwelling catheters used from the onset of diabetes decrease ... [28] Transition from child-centered to adult healthcare systems for ... [29] Evaluation of a systems navigator model for ... [30] A transition care programme which improves ... [31] Transition medicine-from pediatric ... [32] Health care transition in patients with type 1 diabetes ... [33] Transition to adult care for youths with diabetes mellitus: findings from ...

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Introduction

Type 1 Diabetes (T1D) occurs when the autoimmune destruction of pancreatic beta cells leads to insufficient insulin production and hyperglycemia. With insulin replacement, T1D is a chronic disease requiring intensive effort for diabetes and caregivers. Patient and family education is key, as is an acknowledgment of the normal developmental stages and the challenges this brings in daily living with a chronic disease. With proper care and support, children and adolescents with T1D can expect to lead long and fulfilling lives [1, 2]. At first consideration, T1D pathophysiology and management might seem straightforward; however, the more learned about the disease, the less it seems to be truly known [3].

Diabetes mellitus type 1, as a chronic disease, represents a heavy burden on patients and their families. To ameliorate this burden, many diabetes management guidelines around the world have been developed by experts from the international community, such as the International Society for Paediatric and Adolescents Diabetes (ISPAD) [4], the American Diabetes Association (ADA) [5], the National Institute of Clinical Excellence (NICE) [6] and the Canadian Diabetes Association (CDA) [7] aiming to standardize the care provided to their patients. In 2014, ISPAD, in collaboration with the International Diabetes Federation (IDF), introduced three levels of diabetes care; 1) recommended care, 2) comprehensive care, and 3) limited care [8]. The 2018 edition of the ISPAD guidelines included a "Limited Care guidance appendix", aiming to provide basic guidance for the attainment of the major objectives of diabetes care in those health care settings with restricted resources that potentially affect the availability of drugs, personnel, technologies, and procedures [9].

T1D is one of the most prevalent chronic illnesses diagnosed in childhood and occurs in 1:400-600 American children [10]. An increasing number of young children are impacted by T1D [11, 12], with 15-20% of new diagnoses occurring in children under age 5 [13]. This is an alarming figure, and the increased incidence in this youngest age group is unknown. Diabetes management in young children can be challenging for various reasons, including physiological factors such as increased insulin sensitivity and a potentially shortened honeymoon period. Daily T1D management is further complicated by young children's cognitive, behavioral, and social-emotional development.

Since ADA published the Position Statement "Care of Children and Adolescents With Type 1 Diabetes" [14] in 2005, innovations have transformed the landscape and management of T1D; novel autoantibodies, sophisticated devices for delivering insulin, and measuring glucose, and diabetes registries. However, strategies to prevent or delay

T1D in youth remain elusive, and meanwhile, the number of affected children continues to grow.

Diabetes management for children must not be extrapolated from adult diabetes care. In caring for children and adolescents, clinicians need to be mindful of the child's evolving developmental stages and must adapt care to the child's needs and circumstances. Timely anticipatory guidance and care coordination will enable a seamless child/adolescent/young adult transition for both the developing patient and his or her family [1].

In Iraq, pediatric diabetes services are provided through Public Pediatric Diabetes Units (PDU) and the private sector. In each Iraqi province (18 provinces), there are 1-2 public PDU, except Baghdad, the capital city that harbors about 20% or more of the Iraqi population. All of these units are under the authority of the ministry of health and provide their services freely for diabetic patients. Private-sector services (represented by private clinics, labs, pharmacies, and a few large private hospitals), which can cover a large part of the services, are costly and fully paid for by patients. So it is not an easy option for most diabetics, especially in the absence of health insurance in Iraq. Therefore, the public sector should provide standard care to these patients to not force them to receive private services from them.

This study aimed to review the public services provided to children and youth with diabetes in Iraq and compare them with international standards awaiting service improvement.

Instrument and Methods

In this descriptive study that was conducted between November and December 2019, the opinions of physicians running public PDU in 18 provinces of Iraq were collected. These physicians entered the study by convenience sampling method. An invitation with a link to an online questionnaire was sent via WhatsApp messaging system to 28 colleagues running public PDU in 18 provinces of Iraq. In this invitation, the purpose of the study, the voluntary nature of participation, the unconditional right to refuse participation, and opting out from the database were specified. Strict confidentiality of participants' details was ensured, and data were collected anonymously.

The online questionnaire consisted of four main areas:

- 1) Demographic characteristics and number of served patients
- 2) Team composition
- 3) Availability of essential tools, investigations, and medications
- 4) Running the clinics, educational activities, and transition of care

The first page contained a consent question for the participants to proceed with the questionnaire.

Participants had the right not to respond to the survey.

The collected data were described as frequency and then analyzed using the Survey Monkey built-in analyzing tools.

Findings

Eighteen complete responses were received (response rate: 64%) from the physicians representing 18 PDUs from 10 provinces; 7 from Baghdad, two from each of Dhi-Qar and Karbala, and one from each of Najaf, Kirkuk, Ninawa, Anbar, Sulaymania, Wasit, and Babil. All respondents were working in government-led (public) PDUs. The respondent clinicians were eight pediatricians, eight pediatric endocrinologists, and two adult endocrinologists. The number of patients in each center ranged roughly between 98 to 3000 patients. Team composition varied between the PDUs. 44% of PDUs did not have pediatric diabetologists or trained physicians in pediatric diabetes; 50% of them had no diabetes specialist nurses or diabetes educators; 78% had no dietitians, and 94% functioned without a psychologist (Table 1).

Table 1) Availability of team members in PDUs

Team member	Percent
Diabetologist*	56
Diabetic specialist nurse or educator	50
Dietician	22
Psychologist	6
Administration staff	61

*Paediatric diabetologists or trained physicians in pediatric diabetes

The availability of essential and diabetes tools in PDUs has been summarised in Table 2. One-third (33%) of the responding units would have access to both pens and syringes, whereas the syringes alone were available in other 33% of PDUs, and the insulin pens alone in 11%. Four PDUs (22%) had neither access to syringes nor to insulin pens.

Table 2) Availability of essential and diabetes tools in PDUs

Tools	Percent
Essential tools	
Weight scales	100
Stadiometers	78
Sphygmomanometers	89
Different sizes of sphygmomanometers cuffs	33
Tendon hummer	39
Monofilament	None
Diabetes tools	
Insulin syringe	67
Insulin pen	44
Insulin port	0
Glucometer	50
Glucometer strip	44
Blood or urine ketone strip	0
Continuous Glucose Monitor (CGM)	0
Insulin pump	0

The availability of investigations and medications has been illustrated in Table 3. Seven units (39%) had all types of insulin (human and analogs), nine

units (50%) had only human insulin (NPH and short-acting), and two units (11%) had only short-acting insulin.

Table 3) Availability of investigations and medications in PDUs

Investigations and Medications	Percent
Essential investigations	
Blood glucose	100
HbA1c	67
urine albumin/creatinine measurement ACR	22
Coeliac screen	39
Lipid profile	94
Thyroid function test	94
Insulin level or c-peptide	6
Diabetes Auto antibodies	6
Drug availability	
Short-acting insulin	100
NPH insulin	89
Insulin analogues	33
Levothyroxine	61
Statins	11
Sulfonyluria	28
Metformin	50
Glucagon	33

About half of the respondents (56%) offered their patients one-monthly clinic appointments, other 39% of responders would arrange to see their patients every three months, and 6% every six months. The routine annual screening was generally performed in 56% of the units (10 out of 18). HbA1c was checked 3-4 monthly in 94% of the units, and one center (6%) checked the HbA1c 6 monthly for their patients. Unfortunately, 61% of PDUs did not organize any educational activities for their patients and families. The mean age just before transferring pediatric patients to adult services was 16 years, ranging between 14 to 19 years, and the majority of PDUs (78%) had no transition policy, and their patients just get discharged to adults' service.

Discussion

Management of diabetes is best accomplished by having a Multidisciplinary Team (MDT) approach with patient-centeredness [15]. It consists of a physician (general pediatrician with a special interest in pediatric diabetes or pediatric diabetologist/endocrinologist), pediatric diabetes specialist nurse/educator, dietitian, and psychologist [16-18]. The NICE in the United Kingdom recommends that children and young people living with diabetes be seen by this team four times a year and their HbA1c be measured in each visit [6]. According to Table 1, unfortunately, most Iraqi PDUs are not well-structured and do not have an established multidisciplinary team approach. 44% of diabetic patients were deprived of care meant to be delivered by pediatric diabetologists or physicians with a special interest in pediatric diabetes trained in this specialty; instead, they are followed up by a general pediatrician or an adult diabetologist. Overall, there was a shortage of medical staff in Iraq

compared to the population. The ratio of doctors to the population in Iraq is lower than in Iraq's neighbor countries. This could be one of the main contributing factors for the under-structured pediatric diabetes teams. The number of Iraqi physicians per 1000 people is 0.7, and the number of nurses and midwives per 1000 people is 2, whereas the staffing in neighboring countries is generally better as for doctors in Saudi Arabia and Kuwait is 2.6 per 1000 people and for nurses 5.5 and 7.4 per 1000 people, respectively [19].

Implementing the multidisciplinary approach in managing Type 1 Diabetes Mellitus has proven the great improvement of glycemic control [20]; therefore, it is fundamental for Iraq to train and recruit staff who are skilled to work within MDTs to improve the current service. It was noted that more than half of the patients (56% of the centers) were offered monthly follow-up clinic appointments, which is more frequent than the three-monthly international recommendation. Perhaps, this is happening because of the lack of communication means with the patients and the absent role of pediatric diabetes nurses (absent in 50% of units) in arranging home and school visits; hence the physicians are trying to compensate those missed aspects of service to meet with patients and families need. It is important to note that these frequent clinic visits have some drawbacks. Increasing the burden on the already overwhelmed small number of specialized physicians in the field of pediatric diabetes may negatively affect the school attendance of this cohort of children and indirectly negatively affect the province's progress and development due to the impact of frequently taking time off work by parents to attend those frequent clinic visits. In contrast, offering the patients twice appointments per year, which luckily occurred in only one unit (6%), will compromise the service delivery, and it is likely to impact the long-term outcome for their patients [21].

Height, weight, and body mass index (BMI) should be monitored at each visit [22], and the maintenance of a normal growth pattern is an important part of diabetes management [16]. While weight scale was available in all PDUs, 22% did not have a stadiometer, i.e., height and BMI were not checked in 22% of the units. According to the ISPAD guidelines 2018, Chapter 23, which is directed for limited care, recommends screening for microvascular and macrovascular complications and comorbid diseases at specific ages [9]. Therefore, it is necessary to provide the facilities and tools that enable clinicians to monitor the progress of their patient's diseases. Unfortunately, only 56% of Iraqi PDUs run an annual screening for their patients, with limited required tools and laboratory investigations.

Glycaemic control is crucial to managing this disease. It must be assessed by both regular home glucose monitoring and HbA1c [23]. This survey

revealed that only half of the responding PDUs provide their patients with a glucometer, 44% with glucometer strips, and CGM was not available at all. In addition, it revealed that although most PDUs (94%) would plan to check the HbA1c every 3-4 months, it is not available in 33% of units.

According to 2018 ISPAD limited care guidance, "it is strongly recommended that some form of ketone monitoring be available, and when ketone testing is not available or affordable during intercurrent illness, frequent blood glucose monitoring is mandatory to avoid progression to Diabetic Ketoacidosis (DKA)" [9]. Our study showed that none of the responding PDUs in Iraq provides their patient with blood or urine ketone strips. From a cost-effectiveness point of view, checking ketones in the community for hyperglycaemic patients may prevent progress into DKA and save on the cost of hospitalization. Nevertheless, reducing the workload on the overwhelmed healthcare system. When there is no access to the important things needed by patients for their diabetes management through the public services, patients try the private sector, which costs at least \$500 annually (monitoring of complications, comorbid conditions, and glycaemic control). This is unaffordable for many patients who are already under the poverty line. The lack of a health insurance system in Iraq makes it worse.

Away from the short-acting insulin, which was available in all responding centers, the presence of other forms of insulin was variable, similarly for the other important medications in need for managing complications and comorbid conditions. Of course, when the medicine is not provided in those centers, the patients have to buy it privately, which is another burden on them. There was an obvious shortage of insulin analogs (absent in 67% of units), the type that is considered superior to the human insulin by enabling patients to reach targets quicker with lower hypoglycaemic rates [24]. No PDU in Iraq provides their patients with insulin pumps, which is the best way to imitate the physiological insulin profile [25]. Since it is so expensive for almost all Iraqi patients from the private sector, Iraqi patients administer insulin either by syringes or pens. Not all units provide this facility for their patients. Twenty-two percent of units had neither syringes nor pens, so patients bought these essential insulin-administering tools privately and, on many occasions, re-using their syringes and needles, as they could not afford to buy new ones. Even many individuals successfully re-use them without a significant increase in the risk of infection; it should be discouraged if there is concern about hygiene or injection pain [25]. Needle phobia may hinder self-management and compromise glycaemic control [26]. Devices such as I-port can decrease injection pain and ameliorate this problem [27]. Unfortunately, this was not supported in any unit.

The concept of transition to adult care implies a

planned, purposeful movement of the adolescent or young adult with chronic disease from a child (and family) centered to an adult-oriented health care system [28]. Organized transition services may decrease the rate of loss of follow-up, which is associated with more hospitalization due to DKA during this period [29, 30]. There is no established best practice regarding transition age, but transition delay based on the patient's developmental needs may be appropriate [31]. In many countries, the transition age is 18 years, while there is currently no mandated transition age in the US, and available data describe a mean of 19-21 years [32, 33]. According to this study, most Iraqi PDUs (78%) had no organized transition, and there was a wide variation in transition age ranging from 14-19 years, with a mean of 16 years.

This finding warrants further studies investigating the implication of the sudden transfer and perhaps more educational meetings and workshops for adult and pediatric clinicians to be oriented about the importance of transition service.

According to the results of this study, practice auditing is recommended to identify gaps that should be highlighted for health authorities and decision-makers to improve the quality of care.

Conclusion

There is a major shortage of basics and essential requirements for running a good pediatric diabetes service with a wide variation in the provided services between the public pediatric diabetes units.

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References

- 1- Chiang JL, Maahs DM, Garvey KC, Hood KK, Laffel LM, Weinzimer SA, et al. Type 1 Diabetes in Children and Adolescents: A Position Statement by the American Diabetes Association. *Diabetes Care*. 2018;41(9):2026-44.
- 2- American Diabetes Association. 13. Children and Adolescents: Standards of Medical Care in Diabetes-2019. *Diabetes Care*. 2019;42(Suppl 1):S148-64.
- 3- DiMeglio LA, Evans-Molina C, Oram RA. Type 1 diabetes. *Lancet*. 2018;391(10138):2449-62.
- 4- Acerini CL, Codner E, Craig ME, Hofer SE, Maahs DM, editors. *ISPAD clinical practice consensus guidelines* [Internet]. Berlin: ISPAD; 2018 [cited 21 Aug 2021].

Available from: <https://www.ispad.org/general/custom.asp?page=ISPADGuidelines2018>.

5- American Diabetes Association. 13. Children and adolescents: standard of medical care in diabetes 2021. *Diabetes Care*. 2021;44(Suppl 1):S180-99.

6- National Institute for Health and Care Excellence (NICE). Diabetes (type 1 and type 2) in children and young people: diagnosis and management [Internet]. London: NICE; 2015 [cited 21 Aug 2021]. Available from: <https://www.nice.org.uk/guidance/ng18/chapter/1-Recommendations>.

7- Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Can J Diabetes*. 2018;42(Suppl 1):S1-S325.

8- IDF/ISPAD. Global guideline for diabetes in childhood and adolescence [Internet]. Berlin: ISPAD; 2011 [cited 21 Aug 2021]. Available from: <https://www.ispad.org/page/IDFISPAD2011>.

9- Codner E, Acerini CL, Carig ME, Hofer SE, Maahs DM. ISPAD Clinical Practice Consensus Guidelines 2018: Introduction to the Limited Care guidance appendix. *Pediatric Diabetes*. 2018;19(27):326-7.

10- Pettitt DJ, Talton J, Dabelea D, Divers J, Imperatore G, Lawrence J, et al. Prevalence of diabetes in US youth in 2009: the search for diabetes in youth study. *Diabetes Care*. 2014;37(2):402-8.

11- Patterson CC, Dahlquist GG, Gyurus E, Green A, Soltesz G. Incidence trends for childhood type 1 diabetes in Europe during 1989-2003 and predicted new cases 2005-20: a multicentre prospective registration study. *Lancet*. 2009;373(9680):2027-33.

12- Vehik K, Hamman R, Lezotte D, Norris J, Klingensmith G, Bloch C, et al. Increasing incidence of type 1 diabetes in 0- to 17-year-old Colorado youth. *Diabetes Care*. 2007;30(3):503-9.

13- Dabelea D, Bell R, D'Agostino RB, Imperatore G, Johansen JM, Linder B, Liu LL, et al. Incidence of diabetes in youth in the United States. *JAMA*. 2007;297(24):2716-24.

14- Silverstein J, Klingensmith G, Copeland K, Plotnick L, Kaufman F, Laffel L, et al. Care of children and adolescents with type 1 diabetes: a statement of the American Diabetes Association. *Diabetes Care*. 2005;28(1):186-212.

15- Wigert H, Wikström E. Organizing person-centred care in paediatric diabetes: multidisciplinary teams, long-term relationships and adequate documentation. *BMC Res Notes*. 2014;7:72.

16- Cooke DW, Plotnick L, Dabelea D, Klingensmith GJ, Gallo L, Silverstein JH, Winter W. Diabetes mellitus. In: Kappy MS, Allen DB, Geffner ME, editors. *Pediatric practice endocrinology*. New York: McGraw-Hill; 2010. Pp: 343-92.

17- Sperling MA, Tamborlane WV, Battelino T, Weunzimer SA, Phillip M. Diabetes mellitus. In: Sperling MA, editor. *Pediatric endocrinology*. 4th Edition. Elsevier, Saunders; 2014. Pp: 846-900.

18- Butler G, Kirk J. Oxford specialist handbook in pediatrics; Pediatric endocrinology and diabetes. Oxford: Oxford University Press; 2011. Pp: 115-89.

19- The World Bank Group. Physicians (per 1,000 people) [Internet]. Washington: The World-Bank; 2018 [cited 21 Aug 2021]. Available from: <https://data.worldbank.org/indicator/SH.MED.PHYS.ZS>.

20- Deeb A, Attia S, Yousef H, Abdelrahman L, Suliman S,

- Tomy M. Improving Glycemic Control in Children with Diabetes through Implementation of Multidisciplinary Team Approach. *J Endocrinol Diabetes*. 2016;3(2):1-4.
- 21- Fortin K, Pries E & Kwon S. Missed Medical Appointments and Disease Control in Children with Type 1 Diabetes. *J Pediatr Health Care*. 2016;30(4):381-9.
- 22- Styne DM. *Pediatric endocrinology; A clinical handbook*. Sacramento, CA: Springer; 2016. Pp: 263-304.
- 23- DiMeglio LA, Acerini CA, Codner E, Carig ME, Hofer SE, Pillay K, Maahs DM. ISPAD clinical practice consensus guidelines 2018: Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes. *Pediatr Diabetes*. 2018;19(27):105-14.
- 24- Mathieu C, Gillard P, Benhalima K. Insulin analogues in type 1 diabetes mellitus: getting better all the time. *Nat Rev Endocrinol*. 2017;13(7):385-99.
- 25- Danne T, Phillip M, Buckingham B, Jarosz-Chobot P, Saboo B, Urakami T, et al. ISPAD clinical practice consensus guidelines 2018: Insulin treatment in children and adolescents with diabetes. *Pediatr Diabetes*. 2018;19(27):115-35.
- 26- Svoren BM, Jospe N. diabetes mellitus in children. In: Kleigman RM, editor. *Nelson textbook of pediatrics*. 20th Edition. Amsterdam: Elsevier; 2016. Pp: 2760-90.
- 27- Hanas R, Adolfsson P, Elfvin-Akesson K, Hammarén L, Ilvered R, Jansson I, et al. Indwelling catheters used from the onset of diabetes decrease injection pain and pre-injection anxiety. *J Pediatr*. 2002;140(3):315-20.
- 28- Blun RW, Garell D, Hodgman CH, Jorissen TW, Okinow NA, Orr DP, Slap GB. Transition from child-centered to adult healthcare systems for adolescents with chronic conditions. A position paper of the Society for adolescent medicine. *J Adolesc Health*. 1993;14(7):570-6.
- 29- Van Wallegghem N, Macdonald CA, Dean HJ. Evaluation of a systems navigator model for transition from pediatric to adult care for young adults with type 1 diabetes. *Diabetes Care*. 2008;31(8):1529-30.
- 30- Holmes-Walker DJ, Llewellyn AC, Farrell K. A transition care programme which improves diabetes control and reduces hospital admission rates in young adults with Type 1 diabetes aged 15-25 years. *Diabet Med*. 2007;24(7):764-9.
- 31- Nicolarsen J, Weissberg-Benchell J. Transition medicine-from pediatric to adult care: part 1. *Pediatr Ann*. 2017;46(5):e180-1.
- 32- Garvey KC, Wolpert HA, Rhodes ET, Laffel LM, Kleinman K, Beste MG, et al. Health care transition in patients with type 1 diabetes: young adult experiences and relationship to glycemic control. *Diabetes Care*. 2012;35(8):1716-22.
- 33- Nakhia M, Daneman D, To T, Paradis G, Guttmann A. Transition to adult care for youths with diabetes mellitus: findings from Universal Health Care System. *Pediatrics*. 2009;124(6):e1134-41.