



# Healthcare costs associated with newly diagnosed type 1 diabetes in children with Commercial healthplan or Medicaid coverage in US clinical practice

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## INTRODUCTION

- Type 1 diabetes (T1D) is one of the most common chronic childhood diseases in the US, with approximately 304,000 children living with the disease; pediatric T1D incidence has increased in recent years.<sup>1</sup>
- Life expectancy and quality of life of patients living with T1D have increased with recent improvements in disease management; however, T1D remains a life-shortening illness associated with substantial clinical burden, including high prevalence of both macrovascular and microvascular complications.<sup>2,3</sup>
- T1D has an estimated economic burden of >\$30 billion in the US; however, there is a lack of recent cost estimates in children with T1D in the US.<sup>4</sup>

## OBJECTIVE

- In this study, we estimated healthcare costs among pediatric patients with newly diagnosed T1D in routine clinical practice in the US.

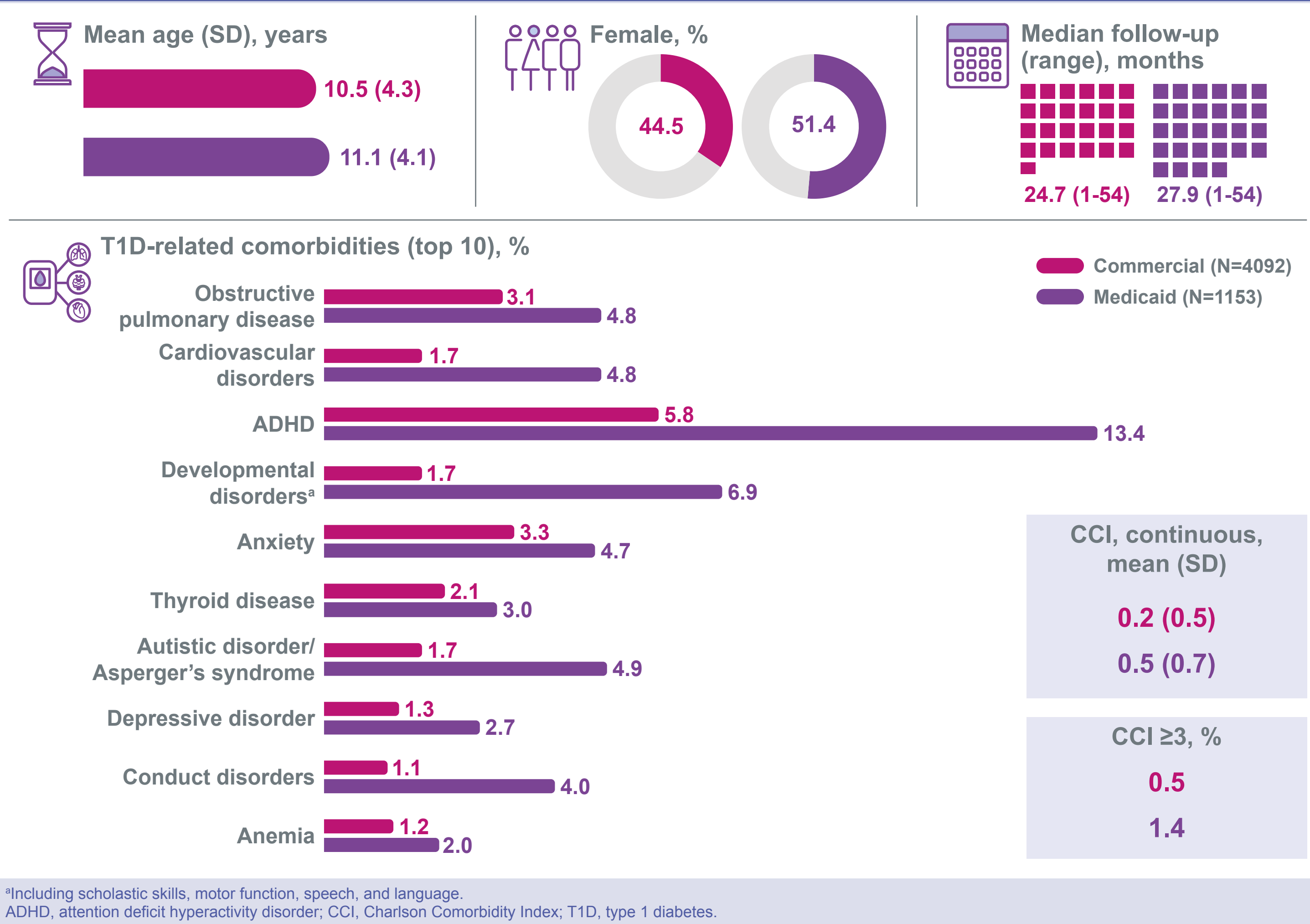
## METHODS

- This retrospective cohort study analyzed Merative MarketScan® data (including Commercial and Medicaid health plan enrollees) from January 1, 2014, to June 30, 2019, for pediatric patients (<18 years) with newly diagnosed T1D.
  - Newly diagnosed T1D was defined as patients with ≥2 medical claims (inpatient or outpatient) with a primary or secondary diagnosis code for T1D (*International Classification of Diseases [ICD], Tenth Revision, E10.X; ICD, Ninth Revision, 250.X1 and 250.X3*) ≥30 days apart.
- The index date was the day of the first qualifying diagnosis of T1D, and patients were required to have continuous health plan enrollment for ≥12 months prior to the index date and ≥1 month of follow-up data; the ≥12-month period prior to the index date was the baseline period.
- After index, follow-up lasted until health plan disenrollment or the last day of available data, whichever occurred first.
- Total T1D-related health plan costs were assessed for patients enrolled in Commercial or Medicaid health plans, and per patient per month (PPPM) costs stratified by time (initial 3 months, 3-6 months, 6-12 months, 12-18 months, and 18-24 months since diagnosis) were reported.
  - All costs were adjusted for inflation to 2019 US dollars using the medical care services component of the Consumer Price Index.
  - Costs excluded rebates, copayments, etc.

## RESULTS

- We identified 4092 patients enrolled in Commercial health plans and 1153 patients enrolled in Medicaid health plans (mean [SD] age: 10.5 [4.3] vs 11.1 [4.1] years; 44.5% female vs 51.4% female, respectively); the median follow-up was 24.7 and 27.9 months, respectively (**Figure 1**).

Figure 1. Baseline characteristics



- Overall T1D-related health plan costs incurred for patients with Commercial and Medicaid health plans were \$34,628 and \$23,517, respectively (**Table 1**).
  - Costs associated with T1D-related inpatient care were more than twice as high for patients enrolled in Commercial (\$5,591) health plans compared with Medicaid (\$2,317) health plans.
    - Inpatient care comprised 16.1% of the overall T1D-related HCRU costs for patients with Commercial health plans and 9.9% for patients with Medicaid health plans (**Figure 2**).

– Similarly, costs for outpatient care for T1D in patients with Commercial (\$2,908) health plans were more than 3-fold those associated with Medicaid (\$880) health plans (**Table 1**).

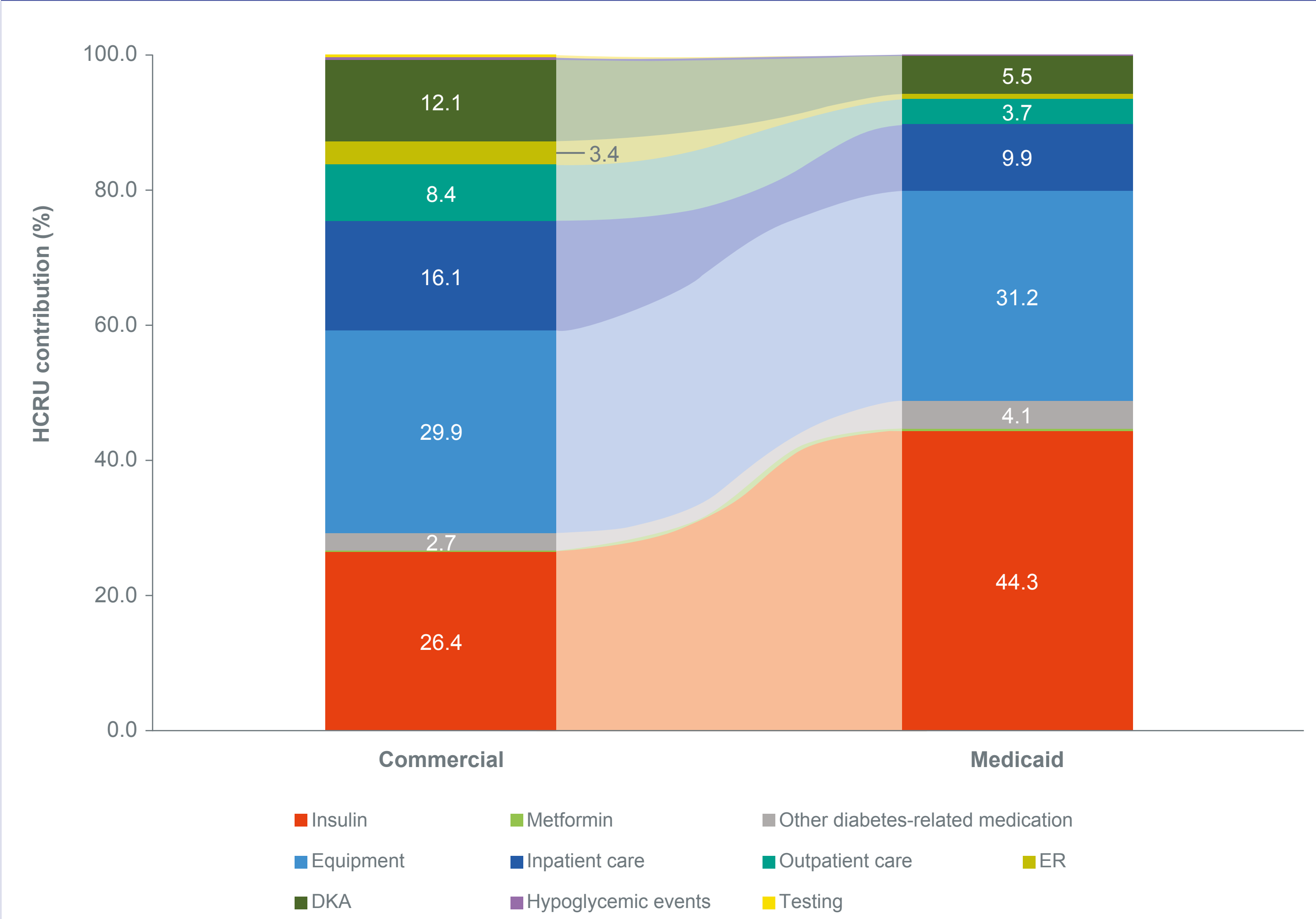
- Outpatient care comprised 8.4% of the overall T1D-related healthcare resource utilization (HCRU) costs for patients with Commercial health plans and 3.7% for patients with Medicaid health plans (**Figure 2**).

Table 1. T1D-related healthcare costs (US dollars) to the health plan among pediatric patients with newly diagnosed T1D during follow-up

|   | Commercial (N=4092) | Medicaid (N=1153) |
|---|---------------------|-------------------|
| <b>T1D-related overall costs, mean (SD), \$US</b>               | 34,628 (39,322)     | 23,517 (21,416)   |
| Insulin   | 9,125 (8,252)       | 10,428 (9,088)    |
| Metformin   | 66 (2,236)          | 71 (857)          |
| Other medication <sup>a</sup>                                   | 938 (1,157)         | 971 (1,177)       |
| Equipment <sup>b</sup>  | 10,356 (10,335)     | 7,327 (8,202)     |
| Inpatient care <sup>c</sup>                                     | 5,591 (29,582)      | 2,317 (11,733)    |
| DKA leading to inpatient care <sup>c</sup>                      | 3,606 (9,547)       | 1,156 (3,520)     |
| Hypoglycemic events leading to inpatient care <sup>c</sup>      | 62 (831)            | 27 (290)          |
| Outpatient care <sup>c</sup>                                    | 2,908 (6,339)       | 880 (1,028)       |
| Emergency room care <sup>c</sup>                                | 1,191 (2,801)       | 166 (516)         |
| DKA leading to emergency room care <sup>c</sup>                 | 568 (1,817)         | 139 (798)         |
| Hypoglycemic events leading to emergency room care <sup>c</sup> | 78 (718)            | 12 (71)           |
| Testing   | 139 (191)           | 23 (36)           |

<sup>a</sup>Includes glucagon, dipeptidyl peptidase inhibitors, and oral hypoglycemic agents (other than metformin).  
<sup>b</sup>Includes insulin pumps, continuous glucose monitors, insulin delivery devices (syringes/needles/pens), glucose test strips, and other monitoring devices.  
<sup>c</sup>Includes claims with diagnosis for T1D (any position).  
DKA, diabetic ketoacidosis; T1D, type 1 diabetes.

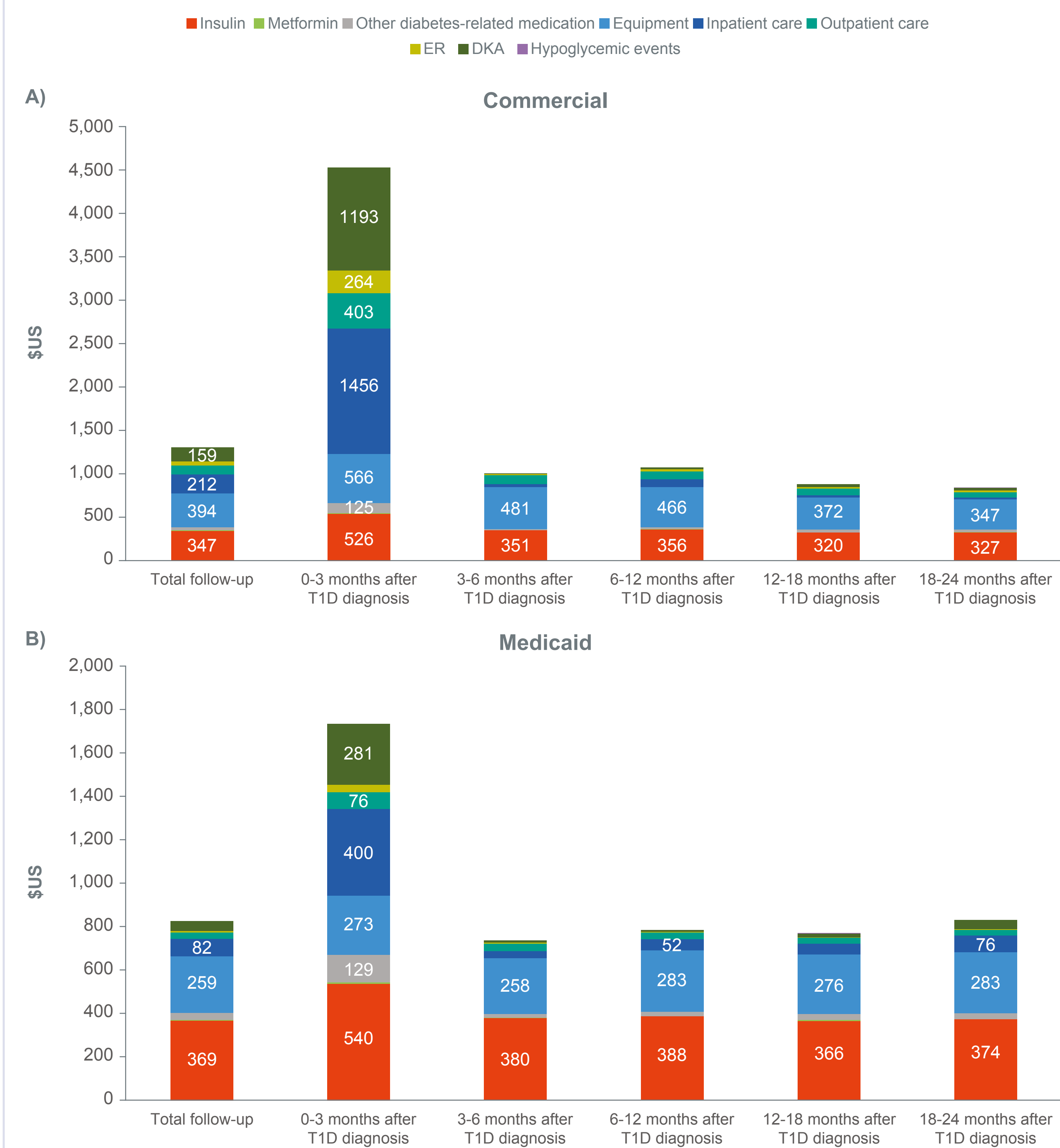
Figure 2. T1D-related healthcare health plan costs contributions among pediatric patients with newly diagnosed T1D during follow-up



DKA, diabetic ketoacidosis; ER, emergency room; HCRU, healthcare resource utilization; T1D, type 1 diabetes.  
Note: DKA and hypoglycemic events include inpatient and ER care. Values <1% are not shown.

- T1D-related PPPM health plan costs were highest during the initial 3 months after diagnosis for both health plan groups (Commercial: \$4,563 vs Medicaid: \$1,742) (**Figure 3**).
  - Compared with the initial 3 months, T1D-related PPPM costs were lower during the remaining follow-up (3-6 months: \$1,019 vs \$742; 6-12 months: \$1,080 vs \$791; 12-18 months: \$886 vs \$776; and 18-24 months: \$853 vs \$837).
  - Inpatient hospitalizations (including for diabetic ketoacidosis) accounted for 55% (Commercial) and 37% (Medicaid) of costs during the initial 3 months; costs decreased substantially for both groups during the remaining follow-up period (3-6 months: 4% and 6%; 6-12 months: 9% and 8%; 12-18 months: 6% and 8%; and 18-24 months: 6% and 14%, respectively).
  - Insulin and equipment accounted for 24% (Commercial) and 47% (Medicaid) of costs during the first 3 months; the contribution of insulin and equipment was higher for both groups during remaining follow-up (3-6 months: 82% vs 86%; 6-12 months: 76% vs 85%; 12-18 months: 78% vs 83%; and 18-24 months: 79% vs 78%, respectively).

Figure 3. T1D-related PPPM health plan costs in different time windows since diagnosis for patients with Commercial and Medicaid health plans



DKA, diabetic ketoacidosis; ER, emergency room; PPPM, per patient per month; T1D, type 1 diabetes.  
Note: Values of <\$50 are not labeled.

## CONCLUSIONS

- Health plan costs in the initial 3 months after diagnosis were over 2.5 times higher in patients with a Commercial health plan than in patients with Medicaid.
- During the initial 3 months, inpatient stays (including for diabetic ketoacidosis) contributed proportionately more to Commercial costs than to Medicaid costs, whereas insulin and equipment contributed proportionately more in patients with Medicaid.
- A common limitation with claims data is the potential for misclassifications and coding errors; however, the T1D case definition used in this analysis is based on age ≤18 years and T1D diagnosis codes.
  - Further, the prevalence of type 2 diabetes is lower in children; thus, the accuracy of this algorithm is expected to have high positive predictive value.
- Overall, pediatric patients with newly diagnosed T1D incurred substantial costs following their diagnosis, particularly those with a Commercial health plan.

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**DISCLOSURES**  
This study was funded by Sanofi.  
Sonia Halhol, Michael Stokes, and Qian Li are employees of Evidera, which received funding for this study. Andrew Cagle and Laura Wilson are employees of Sanofi.  
Laura Wilson is a stockholder of Sanofi.

**ACKNOWLEDGMENTS**  
Medical writing support was provided by Vanessa Gross and Martin Bell of Envision Value & Access and was funded by Sanofi.