The development of the Saudi Billing System supporting national health transformation: methods and justification

Husein Reka[1*], Deniza Mazevska[2], Jim Pearse[2], Abdullah Al Maghrabi[1], Susan E. Young[1] and Shabab Al Ghamdi[1]

Abstract

Background The Saudi health transformation program entails a comprehensive reform of all health system functions. One of the pillars of this reform is the health care financing transformation. The Council of Health Insurance (CHI) aims to bring more transparency and understanding of case-mix through the introduction of patient classification and data standardization. Until recently, the private health insurance sector was using a variety of in-house non-standardized billing codes that impeded transparency and a value-based health care (VBHC) financing model. This study enabled the introduction of standardized billing codes known as the Saudi Billing System (SBS).

Methods We reviewed and assessed several patient classification and billing systems as part of the assessment phase, followed by data collection from the three largest health insurance companies relating to eighty health care providers. A representative sample of 36,299 patient records were re-coded. Coding was undertaken using the Australian Classification of Health Interventions (ACHI) 10th Edition. Codes were assigned based on assessment by clinical coders using an established methodology and followed by an audit to confirm the assigned code or assign an alternative code where the coding could not be adequately completed by the initial coder.

Results Seventy-five percent of records were mapped to an existing ACHI code, leaving 25% being a partial match, an approximate match or other (1%, 22% and 2% respectively). As part of this process, the original ACHI codes were modified, and additional codes were added, ensuring full compatibility with billing practices. We named the new code set the Saudi Billing System (SBS). As a result of this work, we created an additional 1,774 codes, bringing the total SBS code set to 7,947 codes (30% increase from ACHI 10th Edition).

Conclusions Patient classification and standardized billing systems are critical for transparency in providing health care and financing. Working within the existing national patient classification mandate and clinical coding standards required innovative ways to adapt these systems to a private health insurance market (specificity, familiarity, existing license with modification rights and ability to build fee schedule), to address the requirements of a reformed and more value-based insurance market. Current mandated patient classification systems are a good basis for adaptation to serve the needs of the overall health care transformation in the country and a building block towards more transparency and VBHC.

*Correspondence:
Husein Reka
hureka@gmail.com
Full list of author information is available at the end of the article

Background

Patient classification systems are important enablers for health care reforms in pursuit of value-based health care (VBHC) as they bring the much-needed transparency and tools to ascertain the value of health care delivery. Information and capabilities to benchmark are two of the four enablers for VBHC, where standardizing data to measure patient outcomes is pivotal, in addition to payment models and delivery organization [1]. In the context of the Saudi Arabian health transformation as part of Vision 2030, implementation of patient classification systems is one of the key priorities. In line with this priority, the Council of Health Insurance (CHI) has progressed the uptake and implementation of these systems [2].

The Saudi Arabian health system is mainly organized through public provision of care, with the private sector also contributing to financing and delivery of care. However, the private health insurance scheme known as the Cooperative Health Insurance is gaining more importance and share of total health care financing in the country [3–5]. The 2021 National Health Accounts report total health expenditure (THE) of SAR 194.4 billion for the country, out which 13% are private health insurance, with the rest attributed to government spending 77% and out-of-pocket payments of 10% [6]. The Saudi Central Bank for 2022 reported health insurance gross written premium of SAR 31.8 billion (US$ 8.5 billion), an increase of 27 percent compared to previous year [7]. CHI projections anticipate that by 2030, private health insurance will collect around SAR 60 billion worth of premiums and contribute to two per cent of country's Gross Domestic Product, driven primarily by population growth and economic transformation in the country.

In general, the increase of THE and the demographic and epidemic transition in the country constitute the main challenges of the Saudi Arabia health system. Non-communicable diseases (NCDs) are an important aspect of this challenge. Four NCDs (cardiovascular, cancers, chronic respiratory and diabetes) cause 51% of all deaths and are responsible for 28% of all Disability Adjusted Life Years in the Kingdom [8]. Translated into monetary value, the direct cost of seven NCDs (coronary heart disease, stroke, type 2 diabetes, breast cancer, colon cancer, COPD and asthma) account for $ International 8.5 billion [9]. A simple linear projection with 8% compounded average growth rate could bring up Saudi Arabia's THE up to SAR 500 billion or eleven percent of GDP. This makes the case for change in the health sector even more urgent and the need for new models of care based on value.

As a result of these challenges and in line with the Vision 2030 transformation agenda, the health sector has a clear reform plan spearheaded by the Health Sector Transformation Program (HSTP). HSTP was established by a Royal Decree and calls for a sustainable health system delivering health care provision in an effective way [10].

The most recent prominent development in the government health sector is the purchaser-provider split formalization through a series of Royal Court decisions establishing the public single payor entity called the Center for National Health Insurance (CNHI) and the corporatization of public health care providers into the Health Holding Company [11]. This will enable the Ministry of Health to pursue a pure policy and regulatory role in a more efficient way as per the health sector reform plan.

In parallel, the private sector has followed suit and is part of HSTP transformation. CHI, the technical regulator of the private health insurance scheme, launched an ambitious new vision and strategy with a focus on VBHC [12]. This much needed concept for a volume driven private health insurance scheme requires some prerequisites, with data standardization and patient classifications being the most important in the initial phase.

As part of this strategy, CHI launched the National Platform for Health and Insurance Exchange Services (NPHIES), through which all claims are processed. In the design and build phase, CHI mandated data standards and HL7 for interoperability. These are important enablers for building VBHC at a system level, as data, information and benchmarking are critical to VBHC [1].

In the private sector there was a myriad of different commercial reimbursement packages using non-standard codes and information. Utilization of a variety of in-house non-standardized billing codes impeded efforts for transparency and VBHC financing model introduction. With NPHIES, all exchange of claims should follow the Saudi Arabian adopted International Classification of Diseases Tenth Revision Australian Modification, the Australian Classification of Health Interventions and the Australian Coding Standards (ICD-10-AM/ACHI/ACS) 10th Edition, and the Australian Refined Diagnosis Related Groups Version 9 (AR-DRGV9.0) classification. As a corollary of standardization efforts, this left the private sector with no clear non-admitted classification nor billing system, and hence a gap in the overall scheme.

To overcome this challenge, CHI introduced an innovative approach to modify the existing ICD-10-AM/ACHI/ACS system, by expanding and modifying the existing ACHI code set into a Saudi Billing System (SBS). SBS is now a standard billing requirement for NPHIES

and a steppingstone for further enhancement to a patient classification system. The following sections explain the methodology and results of this work.

The aim of this paper is to describe the methodology and results on how a bespoke patient billing system was developed from the existing patient classification system approved and available in Saudi Arabia.

Methods

We requested claims for outpatient visits for one month from three of the largest health insurance companies in KSA. The data request was made in late 2019 and covered claims submitted during the most recent month. The dataset comprised claims from eighty health care providers across KSA who had agreed to share their data for this project. The research team was not provided with characteristics about the providers, except that they were all private. Data on more than two million outpatient visits was received. We reviewed these data and selected a representative sample of 165,742 outpatient visits for analysis. The sample ensured that claims relating to specialties that aligned with the range of chapters in ACHI were represented, and that they were drawn from across the range of contributing providers. Of these, 36,299 records were coded using ACHI, removing claims that solely related to a medical consultation, pathology test or dispensing of a pharmaceutical.

Eight experienced clinical coders were recruited to code the sample records. All coders were certified in clinical coding using ACHI. They came from a variety of backgrounds (i.e. it was not necessary for them to be medically trained) and clinical coding was their main employment. Coding was carried out in a fit-for-purpose online system. In the system, coders were able to bring up a specific record assigned to them for coding and assign ACHI codes to each listed intervention based on the description provided in the record. As the coders attempted to assign ACHI codes, they assessed the adequacy of the code assigned given the description of the intervention from the record. Options available are shown in Table 1.

Records were coded by specialty. Where the description of the intervention was inadequate to assign a code, these records were 'pended' and reviewed by an auditor to determine if a code could be assigned or if indeed the information was inadequate to do so. The auditors also reviewed cases where different ACHI codes were assigned to interventions with similar descriptions. Discrepancies of this nature were resolved through discussion between at least two members of the audit team. The audit team was made up of four individuals with at least a Bachelor's degree in Health Information Management and 10 or more years of clinical coding experience. ACHI codes were selected based on a best fit to match the description. When assigning an exact, partial or approximate label to interventions, the coder was also able to provide a comment to justify the code assigned and/or provide further insight as to why the code was given a partial or an approximate assessment. The coders worked through the list and assigned codes to every case and intervention.

When the coding was completed, descriptive statistics were used to assess the following:

- The description of the intervention provided in the record versus ACHI code description, examining specificity and granularity.
- Coders' assessment of the fit of the ACHI code(s) (i.e., exact, partial, or approximate).

More experienced reviewers worked through the coded cases and coders' comments one-by-one checking the descriptions in the record against the ACHI code assigned in order to:

- Assign an alternative code if the code assigned by the initial coder was not the right fit on review.
- Identify opportunities for breaking up any one ACHI code into more detailed codes, such as when interventions requiring different levels of resource were bundled into the same ACHI code.
- Identify opportunities to add new ACHI codes where there is no code available for the intervention in ACHI.

Results

Assessment of ACHI codes assigned by initial coder

Table 2 shows coders' assessment of ability to assign ACHI codes to interventions listed for each patient. For 58% of cases, more than 80% of coders assessed that they

Table 1 Assessment of codes assigned

The following categories were developed for coders to assess the adequacy of the codes that they assigned to interventions:

- **Exact**. The code assigned exactly matches the description of the intervention provided in the record
- **Partial**. More than one code is required to capture the intervention (e.g., removal of over 15 skin tags requires the use of two codes). There may or may not be codes available in ACHI to capture all of the parts of the intervention listed
- **Approximate**. The code assigned contains a similar description to the description of the intervention in the record, however, the description is not sufficient to attach a code with confidence
- **No match**. There is no suitable code available in ACHI or the intervention is out of scope of ACHI (e.g., glucose strip, which is a medical supply item rather than an intervention)

These were used in the analysis to identify interventions for which more specific or granular ACHI codes may be needed

Table 2 Coders' assessment of ability to assign an ACHI code

Coders' assessment of ability to assign an ACHI code	No. of cases	% of cases
A Exact match > 80%	21,052	58%
B Exact match 50–79%	6,069	17%
C Partial match > 50%	515	1%
D Approx match > 50%	7,986	22%
E Other	677	2%
Grand total	**36,299**	**100%**

Table 3 Review decisions on coded cases (excluding imaging cases)

Review decision	No. of cases	% of cases
Confirm ACHI code assigned by original coder	24,742	71%
Alternative code assigned, using an existing ACHI code	2,394	7%
Alternative code assigned, using a newly created code	5,482	16%
Inpatient procedure	431	1%
Insufficient information provided to assign a code	1,537	4%
Other (not ambulatory or supply of medical device or aid)	142	0%
Grand total	**34,728**	**100%**

could assign an ACHI code that they thought was an exact match to the information provided about the intervention in the patient's record. As explained in the methods section, partial matches were those where more than one ACHI code was needed to capture the service provided, and approximate meant that the description was not adequate to assign an ACHI code to the intervention. Coders identified that for 22% of cases, they could only assign an approximate code, and this was mostly due to poor or inadequate documentation.

Table 3 shows the reviewers decisions of the coded cases. For 7% of the records, the reviewers with more experience in coding and having the advantage of looking at all the cases together, assigned a different (existing) ACHI code to the records than was assigned by the

original coder. In 16% of the cases, the reviewers assigned new codes developed as part of the project.

In 4% of cases the reviewers could not assign a code as the description provided for the intervention was insufficient to do so. Examples of poor documentation were as follows:

- radiology exam
- foreign body removal ENT
- microscopic examination (without the site or nature of the examination specified)
- intramuscular injection (without specifying the purpose of the injection)
- application of cast (without specifying whether the application was associated with a fracture, sprain, or strain and/or specifying where the cast was applied.

Some records were clearly relating to inpatient interventions and others were medical supplies or aids (e.g., provision of crutches).

New Saudi Billing System
Based on this analysis, new codes were created to supplement the ACHI 10th Edition to create the SBS. Table 4 shows the total number of codes in SBS, which is 7,947.

For ambulatory use, 188 new codes were added. Of these, 69 were further split into unilateral/ bilateral, creating 257 new codes. Appendix 1 shows examples of the modifications. In addition, for 1,517 codes that in ACHI 10th Edition do not have a unilateral/ bilateral split, a split was added, creating 1,517 new codes.

Fifty-one ACHI codes were retired. The reason for this is that new codes were developed in place of them. For example, the eleven codes for medical resonance imaging (MRI) for different parts of the body were retired to create new codes with and without contrast medium given the cost differential in MRIs with contrast versus without.

SBS represents close to a 30% increase over the number of codes in the ACHI 10th Edition. That is, ACHI 10th

Table 4 Codes created for the Saudi Billing System (SBS)

Code status	Unilateral/bilateral status	No. of codes	% of Total SBS codes
New ACHI code for KSA	Bilateral	69	0.87%
	Unilateral	69	0.87%
	Not applicable	119	1.50%
Subtotal		*257*	*3.23%*
Existing ACHI code modified for unilateral/bilateral	Bilateral	1,517	19.09%
	Unilateral	1,517	19.09%
Subtotal		*3,034*	*38.18%*
Existing ACHI code, w unilateral/bilateral specification		294	3.70%
Existing ACHI code, w/o unilateral/bilateral specification		4,362	54.89%
Subtotal SBS codes		7,998	100.64%
Codes retired for use in KSA		51	0.64%
Total SBS codes		**7,947**	**100%**

Table 5 SBS code structure

The ACHI codes for medical interventions for use in ambulatory settings were modified to allow inclusion of additional codes and further splits for unilateral/ bilateral interventions.

SBS retains the core 7-digit ACHI code and includes extensions for additional codes and/ or unilateral/ bilateral interventions where applicable.

The SBS codes relate to ACHI10th Edition codes as follows (see Fig. 1).

Where an ACHI 10th Edition code was not modified (except for creating separate unilateral/ bilateral codes where relevant), the SBS 8th digit added was a zero ('0'). Modified ACHI codes have 1, 2, 3 etc. (up to 9) as the 8th digit in SBS. The 9th digit is the unilateral/ bilateral split. Where there is no unilateral/bilateral split, the 9th digit is a zero '0'. Where the code refers to a unilateral intervention, a '1' us used, and where it refers to a bilateral intervention, a '2' is used.

Examples of SBS codes without a unilateral/ bilateral extension are as follows:
- 30,195–01–10 Curettage of lesion of skin, 1 to 14 lesions
- 30,195–01–20 Curettage of lesion of skin, 15 or more lesions

Therefore, the 9th digit is a zero ('0'). The above are also new codes created for SBS, so the 8th digit is a '1' and '2' respectively to indicate that they are modified from the ACHI codes.

Examples of SBS codes with a unilateral/ bilateral extension are as follows:
- 30,075–30-01 Biopsy of inner ear, unilateral
- 30,075–30-02 Biopsy of inner ear, bilateral

Therefore, the 9th digit is a '1' and '2' to indicate unilateral/ bilateral. The 8th digit in the above example is '0' as the ACHI code was not modified except for the unilateral/ bilateral split.
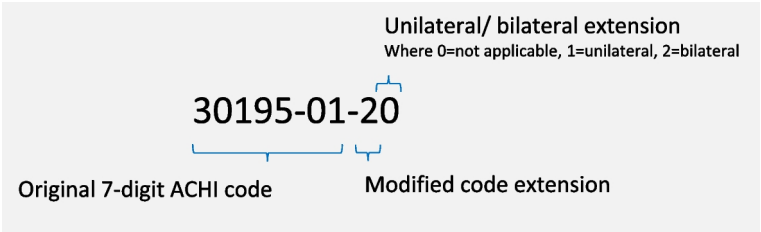

Fig. 1 SBS code structure depiction

Edition has 6,224 codes. Fifty-one of these were retired, but 257 new ambulatory codes were added, and 1,517 codes were split, therefore adding 1,774 codes. Due to changes made to the classification, the original ACHI codes could not be retained in all cases. Therefore, new codes were developed for SBS, modified from the ACHI codes, as shown in Table 5. ACHI is accompanied by the Australian Coding Standards (ACS). However, the standards are inpatient based, therefore, as part of the project, standards and guidelines were created for SBS.

Discussion

This study allowed for ACHI to be modified to the new SBS, which includes additional codes for ambulatory care and differentiation of interventions according to the level of resources used. For example, we created additional codes based on the size of the anatomical structure on which the intervention is performed (e.g., aspiration of a joint), the effort involved due to the number (e.g., number of lesions destroyed, or the number of films used in an x-ray), and age (e.g., circumcision of a newborn vs. circumcision of an older child). We also differentiated between lower-resource interventions, such as fitting of spectacles compared with a comprehensive ophthalmological examination. We also split codes into unilateral/ bilateral where an intervention could be performed on one structure versus two in the case of paired structures (such as eyes, ears, and limbs).

The Saudi Arabian health system is undergoing a major transformation on all aspects of health system functions and new innovative ways on how to achieve these reform objectives is required. Health care financing and the gradual shift to VBHC have seen most of the efforts and focus as part of these reforms. The Private Health Insurance sector is also part of these efforts, and the regulator is enabling the market through series of policies and systems to achieve VBHC. Payers now, due to data standardization and SBS, can shift to more value-based payment models in the market. On the other hand, providers as an integral part of the health insurance system will be keen to demonstrate the added value they bring in the provision of care, while at the same time use data to benchmark and improve care through better organization of care delivery. SBS as a transparent and systematic coding system will enable both payers and providers to demonstrate value in health care. Therefore, patient classification and standardized billing systems are critical in bringing more transparency in health care provision and financing and are an important steppingstone towards VBHC.

Our main findings are that working within the existing national patient classification mandate and clinical coding standards is critical to the success of any bespoke

billing system. While this requires innovative ways and significant resources to adapt and maintain these systems to specific health care financing context such as a private health insurance market (specificity, familiarity, existing license with modification rights and ability to build a fee schedule), they are much needed to address the requirements of a reformed and more value-based health insurance market.

Current mandated patient classification systems are a good basis for modification and adaptation to serve the needs of the overall health care transformation in the country and a building block towards a more transparent and VBHC system. Adopting existing systems enables leveraging of existing platforms of clinical coding in the country, utilization of already trained clinical coding and documentation workforce and most importantly compliance with health information regulation. However, even with such modifications, there is a need to adjust some technology aspects of already established software solutions (e.g., coding and grouping software) to accommodate the modifications. In addition, regular updates and maintenance of classification and billing systems requires significant resources.

Overall, the benefit of utilizing a current patient classification outweighs the cost of introducing a de novo and potentially non-compatible billing system. A key limitation in undertaking this work was the low level of documentation available to the coders for assigning ACHI codes. As mentioned earlier, coders identified that for 22% of cases, they could only assign an approximate code, and this was mostly due to poor or inadequate documentation. This is an issue that needs to be addressed going forward, as the coding (and therefore billing) will be inaccurate if adequate documentation is not provided.

Another key limitation was that the study was conducted on a sample of cases and interrater reliability was not calculated. While the sample selected was aimed to be representative, it is a sample, and there may have been situations that were not encountered in the coded data and therefore not reflected in the resulting code set and guidance provided. In addition, we also had a team of four experienced clinical coding auditors checking records where there was inadequate information in the medical record to allocate an ACHI code and to confirm that this was the case. Also this team reviewed discrepancies between coders when the same intervention description was coded in a different way by the clinical coders. Acknowledging this, CHI implemented this initial version of the SBS amongst private providers and collected information to fill any gaps identified for Phase 2 of this work.

Conclusions

Patient classifications and standardized billing systems are critical in bringing transparency in health care provision and financing. Working within the existing national patient classification mandate and clinical coding standards is crucial in developing these modifications (specificity, mandate, education). Existing mandated patient classification systems are a good basis for modification and adaptation to serve the needs of the overall health care transformation in the country and a building block towards more transparency and VBHC.

However, even modifications of existing systems require active maintenance, regular dissemination, education of workforce and stakeholders, and adequate governance. This requires significant resources and committed efforts from regulators. In parallel, health regulators in their pursuit for VBHC should reinforce the requirements for better clinical documentation and implementation of patient classification systems for standardized data capturing and utilization.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-025-12652-6.

> Supplementary Material 1.

Data availability
The datasets generated and/or analyzed during the current study are not publicly available. However, data are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was carried out as a quality improvement activity. The need for ethical approval and consent to participate was waived by the Ethics Committee/Institutional Review Board of King Fahad Medical City IRB log number 23–389 (IRB registration with OHRP/NIH USA: IRB0010471). All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication
Not applicable.

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Author details
¹Council of Health Insurance, Riyadh, Saudi Arabia
²Health Policy Analysis, Sydney, Australia

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