

Reinsurance Optimization and Risk Retention Strategies for Strengthening Saudi Arabia's Medical Insurance Market under Vision 2030

Abstract

Saudi Arabia's medical insurance market is the largest segment of the national insurance sector and is characterized by high premium retention, large member populations, rapidly developing health-service utilization, and continuing pressure on medical claims costs. These characteristics make reinsurance optimization fundamentally different from property and casualty reinsurance. In medical insurance, the central objective is not to transfer a large share of ordinary claims, but to determine how much predictable medical risk can be retained efficiently while protecting the insurer from high-cost individuals, adverse group experience, aggregate deterioration and emerging medical-cost shocks. This paper examines reinsurance optimization and risk-retention strategies for Saudi medical insurance under Vision 2030. It uses an integrative review of reinsurance, health-insurance risk and actuarial literature together with official Saudi Insurance Authority market evidence. The 2024 Saudi insurance market report shows that health insurance gross written premiums reached approximately SAR 42.25 billion, net written premiums reached SAR 41.40 billion, the retention ratio was 98%, and gross claims were approximately SAR 33.8 billion, producing a gross loss ratio of 83%. In the first quarter of 2026, health insurance remained the largest market segment, with gross written premiums of SAR 18.5 billion and 14.5 million beneficiaries. Against this background, the paper proposes a Saudi Medical Insurance Reinsurance Optimization Framework integrating medical underwriting, claims experience, TPA data, pricing, specific and aggregate stop-loss structures, capital tolerance, counterparty quality and continuous loss-ratio monitoring. The analysis argues that optimal medical retention is not a target percentage but a dynamic risk decision. Since the market already retains most health premium, value increasingly lies in protecting against claim severity and volatility rather than increasing retention mechanically. The framework supports underwriters and risk managers in balancing pricing adequacy, portfolio growth, solvency resilience and reinsurance cost while remaining aligned with Vision 2030 and the evolving Saudi insurance regulatory environment.

Keywords: Medical insurance; health insurance; reinsurance optimization; risk retention; Saudi Arabia; Vision 2030; medical underwriting; stop-loss reinsurance; loss ratio; TPA; pricing; Insurance Authority.

1. Introduction

Medical insurance differs from most other insurance classes because insured losses arise from the utilization and cost of healthcare rather than from discrete property or casualty events. Claims occur at high frequency, are strongly influenced by age, benefit design, provider network, medical inflation, utilization behavior and chronic disease, and may also contain a small number of extremely high-cost cases. The underwriting and reinsurance problem is therefore a combination of predictable attritional cost and uncertain severity. A medical insurer must price the expected healthcare consumption of a group while preserving protection against experience that is materially worse than expected.

This distinction is highly relevant to Abdul Waheed Mohammed's professional field. His updated curriculum vitae identifies him as a Senior Underwriting Manager in Medical Insurance and records more than seventeen years of experience in corporate and SME medical insurance, including portfolio analysis, gross and net loss-ratio monitoring, pricing, underwriting guidelines, claims experience, TPA interaction and reinsurance support. His work includes weekly monitoring of paid and outstanding claims, handling medical underwriting decisions for corporate and SME groups, analyzing claims and underwriting data for reinsurance approval, and supporting competitive pricing for reinsurance treaties. The research topic is therefore closely connected to the technical activities of medical underwriting rather than to generalized insurance risk.

Reinsurance transfers part of an insurer's accepted risk to another risk carrier. In medical insurance, the most relevant protection is often structured around unusually expensive individual claims or aggregate portfolio deterioration. Specific stop-loss protection responds when the claims of an individual insured life exceed a defined threshold, while aggregate stop-loss protection responds when total claims for a portfolio exceed a predetermined percentage or amount. Quota-share or other proportional structures may also be used where broader capital support or growth capacity is required. Zhang (2021) demonstrates that health-insurance reinsurance can be optimized through combinations of quota-share and excess-of-loss structures, while international health-market evidence shows that reinsurance can materially stabilize insurers exposed to high-cost claims.

Saudi Arabia provides an especially important environment for this research because health insurance dominates the national insurance market. According to the Insurance Authority's 2024 market report, health insurance gross written premiums were approximately SAR 42.25 billion, net written premiums approximately SAR 41.40 billion, and the reported retention ratio was 98%. Claims were approximately SAR 33.8 billion and the gross loss ratio was 83%. This indicates that the Saudi medical insurance sector already retains most of its premium and underlying claims risk. The key strategic issue is consequently not whether health insurers should simply retain more, but whether the existing high level of retention is structured efficiently across normal, high-cost and aggregate loss layers.

The market has continued to expand. In the first quarter of 2026, the Insurance Authority reported health insurance gross written premiums of SAR 18.5 billion, representing 62% of the total market, with 14.5 million beneficiaries. Larger membership, greater healthcare utilization and continuing competition increase the importance of accurate underwriting, claims forecasting and risk transfer. Even where the overall loss ratio is manageable, one high-cost oncology case, transplant, neonatal case, rare disease treatment or prolonged intensive-care admission can materially affect a small or medium corporate portfolio. At the aggregate level, medical inflation, utilization change or provider behavior can create deterioration across many groups simultaneously.

Reinsurance optimization in medical insurance should therefore be understood as a portfolio-protection problem. The insurer must determine the level at which medical claims become financially inefficient to retain, how much aggregate deterioration can be tolerated, whether proportional support is justified, which reinsurers should participate, and how treaty costs interact with pricing and capital. The design must also recognize that the primary insurer remains responsible to the policyholder and that reinsurance does not substitute for sound underwriting or appropriate pricing.

This paper develops a Saudi-specific framework for these decisions. It integrates medical portfolio characteristics, claims-experience analysis, TPA data, pricing, specific and aggregate stop-loss protection, capital tolerance, counterparty risk and continuous monitoring. The paper also explains why high market retention should not be confused with optimal retention and why medical reinsurance should be evaluated using loss volatility, severity concentration and capital protection rather than ceded-premium percentage alone.

2. Aim, Objectives and Research Questions

The aim of this study is to develop an evidence-based framework for optimizing reinsurance and risk retention in Saudi medical insurance in a manner that improves loss-ratio stability, protects capital and supports sustainable corporate and SME portfolio growth under Vision 2030.

Five objectives guide the analysis. First, the study identifies the medical and actuarial factors that should determine retention levels, including claims frequency, severity, group size, age mix, benefit design, chronic disease burden and medical-cost trends. Second, it evaluates specific stop-loss, aggregate stop-loss, proportional and combination reinsurance structures for medical portfolios. Third, it examines how TPA claims data and underwriting experience can improve reinsurance attachment-point and pricing decisions. Fourth, it assesses the interaction among medical retention, capital, reinsurance cost, counterparty quality and the emerging Saudi Risk-Based Capital environment. Fifth, it proposes a practical framework and performance scorecard for medical underwriting and reinsurance teams.

The paper addresses four research questions. RQ1: Which factors should determine optimal medical-insurance retention in Saudi corporate and SME portfolios? RQ2: How can specific and aggregate reinsurance reduce the financial impact of high-cost medical claims and portfolio deterioration? RQ3: How should underwriting, claims and TPA data be integrated into retention and treaty-pricing decisions? RQ4: How can Saudi medical insurers preserve their high premium retention while maintaining adequate protection against severe and unexpected claims?

3. Review Methodology

This study adopts an integrative review and conceptual-synthesis methodology. The topic combines health-insurance underwriting, actuarial pricing, reinsurance, claims management, solvency regulation and healthcare utilization. An integrative design is therefore appropriate because the objective is to connect technical reinsurance theory with medical-insurance operating practice and the Saudi regulatory environment.

The literature review emphasized peer-reviewed work on optimal reinsurance, health-insurance reinsurance, stop-loss protection, high-cost claims, solvency, retention design and counterparty risk. Relevant actuarial research on quota-share, excess-of-loss, multiple reinsurers and default risk was retained from the original paper because the underlying optimization principles remain applicable. Health-specific studies were added to explain why reinsurance can be particularly valuable when a small number of members produce disproportionately high claims. Zhang (2021) provides a formal health-insurance model combining quota-share and excess-of-loss reinsurance, while Jacobs, Cohen

and Keenan (2017) show empirically that reinsurance improved financial outcomes for insurers with the highest health claims costs.

Official Saudi evidence was drawn from Insurance Authority annual and quarterly market reports and the National Insurance Sector Strategy. These sources establish the size, retention and loss characteristics of health insurance and the broader regulatory direction under Vision 2030. The study also uses the updated professional profile as contextual evidence for the practical focus of the research: medical underwriting, corporate and SME portfolios, claims-experience analysis, TPA data, loss-ratio monitoring, pricing and reinsurance support.

The synthesis is organized around six themes: medical portfolio diagnosis; high-cost claim risk; aggregate claims deterioration; reinsurance structure; capital and counterparty management; and data-driven monitoring. These themes are mapped to four desired outcomes: pricing adequacy, loss-ratio stability, solvency resilience and sustainable portfolio growth.

No fabricated insurer data, medical claims records or proprietary treaty prices are used. The paper does not claim that a specific attachment point is optimal for all Saudi insurers. Attachment points should be estimated from each insurer's actual claims distribution, group size, capital and reinsurance market conditions. The proposed framework is therefore conceptual and designed for later empirical validation using de-identified claims and treaty data.

4. Saudi Medical Insurance and Vision 2030 Context

Saudi health insurance is structurally different from the property and casualty market that formed the focus of the original paper. The 2024 Insurance Authority report shows that health insurance gross written premiums reached approximately SAR 42.25 billion and net written premiums approximately SAR 41.40 billion, producing a retention ratio of 98%. Gross claims were approximately SAR 33.8 billion and the gross loss ratio reached 83%. These figures mean that Saudi health insurers already retain the great majority of the premium and risk they underwrite.

This high retention changes the policy question. In property and casualty insurance, a strategy may seek to increase domestic retention because large portions of risk are ceded. In medical insurance, the emphasis should instead be on the quality of retention. Ordinary and predictable claims can remain with the primary insurer, while unusually severe individual claims or aggregate deterioration can be transferred selectively. The strategic goal is therefore efficient retention rather than simply higher retention.

The first-quarter 2026 market results reinforce the importance of this issue. Health insurance generated SAR 18.5 billion in gross written premiums and accounted for 62% of total market premiums, with 14.5 million beneficiaries. The scale of the portfolio creates diversification benefits, but it also makes small changes in utilization, medical inflation or provider behavior financially significant. A one-percentage-point change in claims experience can represent a substantial amount of money at market scale.

Medical underwriting operates through recurring renewal cycles. Corporate and SME groups are assessed using member demographics, benefit structures, network design, prior claims, paid and outstanding claims, high-cost cases and expected trend. The updated CV demonstrates direct experience in these activities, including weekly loss-ratio monitoring, corporate and SME

underwriting, identification of major medical conditions, automated frequent-user reports, renewal technical results, and reinsurance pricing support. This makes claims-experience credibility central to both primary pricing and reinsurance design.

Saudi health insurance is also integrated with healthcare and regulatory platforms. Historically, medical insurers have interacted with CCHI systems and TPAs, and underwriting decisions depend on the quality and timeliness of claims and member data. When data are fragmented or delayed, both primary pricing and reinsurance attachment-point decisions become less reliable. Better data integration can therefore reduce both underwriting uncertainty and the risk margin demanded by reinsurers.

Vision 2030 and the National Insurance Sector Strategy support a larger, more efficient and technically mature insurance sector. For medical insurance, the practical contribution of reinsurance is not simply capital export or premium retention. It is a mechanism for allowing insurers to write large corporate and SME groups confidently, protect against high-cost claims and preserve stable technical results while continuing to expand coverage and service quality.

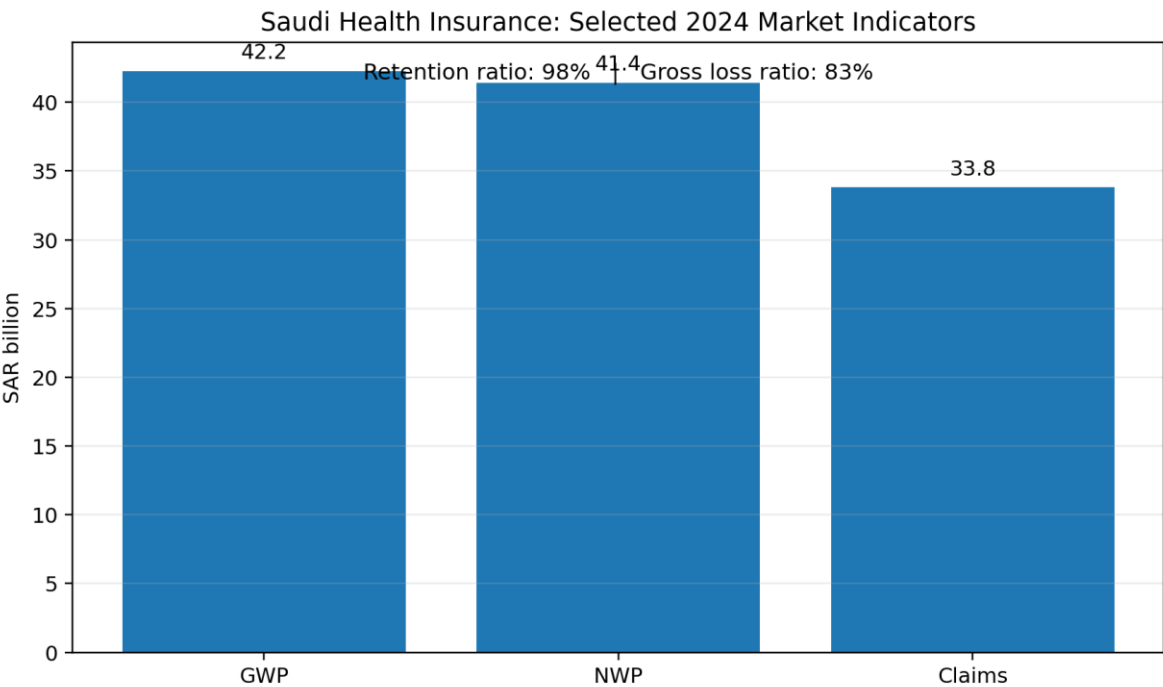


Figure 1. Saudi health insurance selected market indicators, 2024.

Source: Insurance Authority, The Saudi Insurance Market Report 2024.

183 **Table 1. Selected Saudi medical insurance market indicators**

Indicator	Period	Reported value	Relevance to reinsurance
Health GWP	2024	SAR 42.25 billion	Shows the scale of the medical risk pool
Health NWP	2024	SAR 41.40 billion	Indicates most premium is retained by primary insurers
Health retention ratio	2024	98%	Optimization should focus on severity protection, not mechanical retention growth
Health gross claims	2024	SAR 33.8 billion	Large claims base makes claims analytics critical
Health gross loss ratio	2024	83%	Demonstrates importance of pricing and utilization control
Health GWP	Q1 2026	SAR 18.5 billion / 62% market share	Health remains the dominant Saudi insurance segment
Health beneficiaries	Q1 2026	14.5 million	Large membership increases diversification but also aggregate exposure

184 **5. Determinants of Medical Insurance Risk Retention**

185 Medical retention should begin with the statistical structure of claims. A typical health portfolio
186 contains many low- and medium-cost claims and a much smaller number of very expensive cases.
187 Routine outpatient consultations, pharmacy, diagnostic testing and ordinary hospital admissions are
188 relatively frequent and become more predictable as portfolio size increases. By contrast, organ
189 transplantation, oncology, neonatal intensive care, rare diseases, complex surgery and prolonged
190 hospitalization may generate severe losses that are difficult to forecast at individual-group level.

191 The first determinant of retention is therefore group size. A large corporate group provides more
192 credible historical experience than a small SME group because the law of large numbers reduces
193 random fluctuation. For a small group, one high-cost member can transform an otherwise acceptable
194 loss ratio into an unprofitable result. Specific stop-loss protection can be more valuable for such
195 portfolios because it limits the maximum retained loss per individual.

196 The second determinant is claims severity concentration. Underwriters should not rely only on the
197 overall loss ratio. Two portfolios can both show an 80% loss ratio but have very different future risk.
198 One may contain many predictable moderate claims, while the other may depend heavily on a few
199 ongoing cancer or chronic-disease cases. The latter may require a different retention or pricing
200 response even if the historical ratio is the same.

201 The third determinant is the relationship between paid and outstanding claims. Medical claims
202 develop over time and a renewal decision made only from paid claims may underestimate ultimate
203 cost. TPA data should therefore include paid claims, outstanding claims, incurred-but-not-reported
204 estimates where relevant, large-case reserves and treatment continuation. The updated professional
205 profile specifically records monitoring of paid and outstanding claims through TPAs, making this
206 issue directly relevant to the author’s underwriting specialization.

207 The fourth determinant is benefit and network design. Richer benefits, broader networks, low
208 cost-sharing and access to high-cost providers increase expected claims and can also increase claim

severity. Reinsurance attachment points should be considered together with the benefit structure rather than as a fixed market number.

The fifth determinant is medical trend. Even if historical claims are credible, future claims may increase because of provider price changes, utilization growth, pharmaceutical innovation or expensive new therapies. A retention that was appropriate under one cost environment may become too high when severity trends accelerate.

The sixth determinant is the insurer's capital and risk appetite. A well-capitalized insurer with a large diversified health portfolio may rationally retain a higher specific threshold than a smaller insurer. The decision should reflect the amount of loss that can be absorbed without causing unacceptable volatility in earnings or solvency. The optimum is consequently insurer-specific and must be reviewed as membership, benefits, claims trends and capital change.

6. Medical Reinsurance Structures and Stop-Loss Optimization

Specific stop-loss reinsurance is one of the most natural structures for medical insurance. The insurer retains each member's claims up to an attachment point, after which the reinsurer reimburses an agreed share of eligible costs subject to limits and contract conditions. This arrangement targets severity rather than normal utilization. It is particularly relevant to high-cost inpatient, oncology, neonatal and complex chronic cases.

Attachment-point selection is critical. If the threshold is too low, the insurer transfers predictable claims and pays unnecessary reinsurance cost. If it is too high, the insurer remains exposed to individual cases capable of materially damaging group or portfolio results. The optimal threshold should therefore be modeled from the distribution of large claims rather than selected by convention. Factors should include group size, historical high-cost cases, expected medical trend, capital tolerance, benefit limits and the reinsurer's pricing curve.

Aggregate stop-loss protection addresses a different problem. Instead of responding to one member, it responds when total claims for a defined portfolio exceed an agreed level. An aggregate attachment might be linked to expected claims or a percentage of premium. This structure protects against broad deterioration caused by utilization increases, medical inflation, provider behavior or multiple moderate large claims that individually remain below the specific threshold.

A combined program can therefore be more effective than either structure alone. Specific protection controls individual severity, while aggregate protection controls portfolio-level frequency and trend. The combination is especially relevant to medical insurance because adverse results may arise through either mechanism.

Quota-share reinsurance can also play a role, although it is less directly targeted. A reinsurer receives a fixed share of premium and pays the same share of claims. This can support rapid growth, provide capital relief or allow a smaller insurer to enter a new medical segment. However, where a mature Saudi health insurer already retains 98% of market premium overall, proportional cession should be justified carefully because it also transfers profitable ordinary business.

Facultative or case-specific arrangements may be relevant for unusual high-limit exposures, international medical benefits or portfolios containing exceptional known risks. Nevertheless, routine medical reinsurance should avoid adverse selection between the insurer and reinsurer. Treaty wording

should define eligible claims, continuation treatment, pre-existing conditions where applicable, exclusions, recoveries, claim notification, aggregation rules and reimbursement timing.

The insurer should evaluate each structure economically. Expected recoveries alone are insufficient because reinsurance is intended to protect against adverse outcomes, not to generate normal-year profit. Analysis should compare ceded premium, commissions, expected recoveries, tail-loss reduction, capital relief, earnings volatility and administrative complexity. A treaty that rarely recovers can still be valuable if it protects the balance sheet from the exact events the insurer cannot tolerate.

Table 2. Medical reinsurance structures and strategic use

Structure	Trigger	Primary benefit	Key risk	Best use
Specific stop-loss	Individual claim exceeds attachment point	Limits severity from high-cost members	Attachment may be too low/high	Oncology, transplant, neonatal, complex inpatient claims
Aggregate stop-loss	Portfolio claims exceed aggregate threshold	Protects against broad deterioration	Can be expensive in high-loss portfolios	Medical inflation, utilization surge, multiple moderate claims
Quota share	Fixed percentage of premium and claims	Capital support and growth capacity	Transfers profitable ordinary claims	New/growing books or temporary capital support
Facultative / case-specific	Individual unusual exposure	Specialist capacity	Operational complexity	Exceptional benefit limits or unusual high-risk cases

7. TPA Data, Claims Experience and Underwriting Integration

Claims and TPA data are the analytical foundation of medical reinsurance. The value of a sophisticated treaty is limited if the insurer cannot identify large cases, project ultimate claims or distinguish between routine and emerging severity. Medical underwriting should therefore maintain a continuous feedback loop between group underwriting, TPA claims experience, actuarial pricing and reinsurance.

The first requirement is a consistent member and claims data structure. Each group should be traceable by policy year, member count, age and gender distribution where permitted, benefit level, network, geographic profile, paid claims, outstanding claims, high-cost members and major diagnostic categories. Data definitions should be stable across renewal periods so that trends are meaningful.

The second requirement is large-case monitoring. High-cost cases should be identified early, not only at renewal. Case-management information, expected treatment continuation and known future procedures may materially affect the next policy period. Underwriters should distinguish one-off completed cases from ongoing chronic or oncology cases likely to recur.

The third requirement is loss-ratio decomposition. A single portfolio loss ratio should be separated into attritional claims, high-cost individual claims and unusual events. This helps determine whether the problem should be addressed through pricing, benefit design, provider management or reinsurance. If poor performance is driven by ordinary utilization, purchasing more stop-loss may not

277 solve the underlying problem. If deterioration is driven by a few severe cases, specific reinsurance
278 becomes more relevant.

279 The fourth requirement is credibility. A large group with several years of stable experience may
280 justify experience-based pricing, while a small SME portfolio needs greater reliance on pooled
281 assumptions. Reinsurance attachment points can also reflect credibility. Smaller, less credible
282 portfolios may require lower thresholds because their relative volatility is higher.

283 The fifth requirement is reconciliation between underwriting and reinsurance data. Recoverable
284 claims should be tracked against treaty terms, and potential recoveries should not be assumed merely
285 because a claim is large. Eligibility, exclusions, attachment, coinsurance and annual limits must be
286 verified. Delayed or disputed recoveries can create liquidity pressure even when the ultimate claim is
287 covered.

288 Figure 3 illustrates the recommended feedback loop: member and benefit data support
289 underwriting; TPA claims experience updates expected cost; pricing forecasts incorporate trend and
290 credibility; reinsurance analysis selects appropriate protection; and renewal monitoring compares
291 actual outcomes with the assumptions used. This loop is consistent with the updated CV's emphasis
292 on analytical reporting, TPA interaction, pricing, underwriting guidelines and reinsurance approval.



Feedback loop: claims experience → underwriting guidelines → pricing → retention/reinsurance → portfolio performance

293

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Figure 2. Medical underwriting, TPA claims and reinsurance feedback loop.

295 **8. Pricing, Capital Efficiency and Risk-Based Capital**

296 Medical reinsurance must be integrated with pricing rather than treated as a separate finance
297 purchase. The gross premium should first reflect expected claims, expenses, risk margin and
298 appropriate commercial considerations. The cost of reinsurance then needs to be allocated in a way
299 that reflects the protection consumed by the group or portfolio.

300 For specific stop-loss, groups with greater expected severity or richer benefits may consume more
301 reinsurance capacity. A uniform reinsurance loading can therefore distort profitability. Large
302 corporate portfolios may support more customized modeling, while SME portfolios can be grouped

into homogeneous risk cells. The underwriting system should show both gross expected claims and net expected claims after reinsurance so that pricing decisions remain transparent.

Loss-ratio targets should also be viewed on both gross and net bases. Gross loss ratio measures the technical quality of primary pricing before reinsurance, while net results show the effect of risk transfer. A favorable net result produced only by heavy reinsurance does not prove that primary pricing is adequate. Conversely, a temporarily high gross ratio driven by a recoverable catastrophic case may not indicate structural underpricing.

Reinsurance pricing itself should be monitored across renewals. If reinsurers increase rates because high-cost claims are becoming more frequent, the insurer should determine whether the change reflects its own portfolio, the wider market or global medical-severity trends. Attachment points, coinsurance and limits can be adjusted rather than accepting only a headline premium increase.

The transition to a Risk-Based Capital framework in Saudi Arabia from 2027 increases the relevance of this analysis. Medical insurers retaining 98% of premium must demonstrate that the resulting underwriting risk is supported by sufficient capital and effective risk management. Reinsurance can reduce tail volatility and potentially capital requirements where the transfer is recognized and reliable, but it also introduces counterparty risk. Capital optimization should therefore consider the net effect of both risks.

Stress testing should include scenarios such as multiple high-cost oncology cases, a cluster of neonatal claims, rapid specialty-drug inflation, unexpected utilization growth, TPA reporting delay and simultaneous deterioration across several large groups. Each scenario should be modeled gross and net of reinsurance. Reverse stress testing can identify the claim level or loss ratio at which internal capital tolerance would be breached.

9. Counterparty Risk and Reinsurance Market Strategy

Reinsurance creates credit exposure to the reinsurer. The medical insurer remains obligated to pay eligible claims even if a reinsurer delays or disputes reimbursement. Counterparty selection is therefore an important part of medical retention strategy.

Relevant criteria include financial strength, claims-paying reputation, contract certainty, medical-reinsurance expertise, service quality, jurisdiction, collateral where appropriate and concentration. A low-priced treaty may be unattractive if the reinsurer has weak recovery performance or restrictive wording. The expected value of protection depends on the probability and timing of recovery as well as the nominal limit.

Panel diversification can reduce dependence on a single reinsurer. However, medical reinsurance differs from catastrophe property programs because claims may be numerous and operationally intensive. Excessive fragmentation can increase administration and dispute risk. The panel should therefore balance credit diversification with efficient claims handling.

Domestic reinsurance capacity can support Vision 2030 by keeping more reinsurance premium and technical expertise within Saudi Arabia. Yet Saudi health insurance already has a 98% primary retention ratio. Localization should therefore focus on the quality of the reinsurance layers that

remain necessary, particularly high-cost and aggregate protection, rather than on increasing primary retention beyond prudent levels.

International reinsurers may continue to be useful for very high limits, global medical portfolios and diversification of severe claims. The appropriate structure is complementary: retain predictable medical risk within the primary insurer, use domestic capacity where it adds sound risk-bearing value, and access global capacity where additional diversification or expertise is economically justified.

Governance should specify counterparty limits, approved security criteria, claims-notification requirements, aged-recoverable monitoring, dispute escalation and periodic treaty performance review. The underwriting and reinsurance teams should also analyze whether repeated recoveries are signaling an attachment point that is too low or a primary portfolio whose pricing needs correction.

10. Proposed Saudi Medical Insurance Reinsurance Optimization Framework

The proposed Saudi Medical Insurance Reinsurance Optimization Framework contains five connected layers. The first is medical portfolio diagnosis. This layer evaluates group size, membership profile, benefit design, network, historical loss ratio, paid and outstanding claims, high-cost cases, chronic conditions, medical trend and data credibility. The objective is to understand not only average claims but the shape and concentration of risk.

The second layer is retention design. The insurer defines the amount of individual and aggregate medical volatility it can absorb within capital and earnings tolerances. Retention is therefore expressed through specific attachment points, aggregate thresholds and internal portfolio limits rather than through a single percentage.

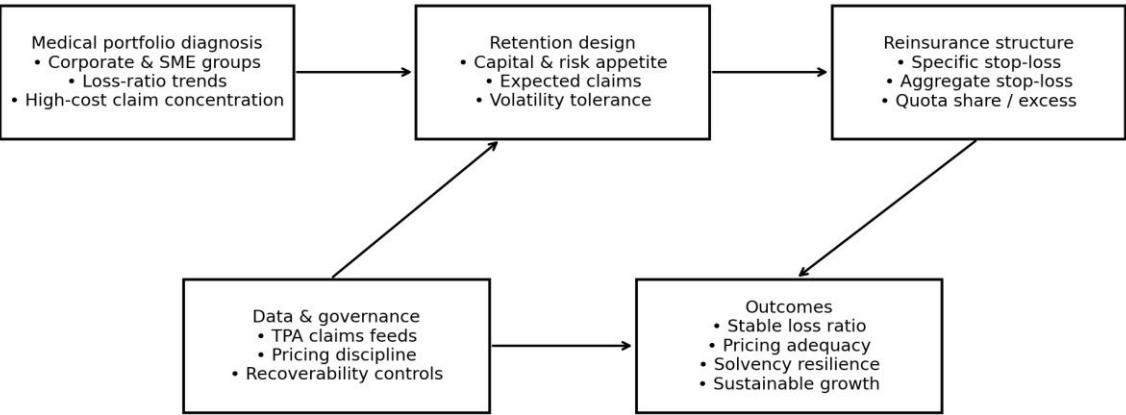
The third layer is reinsurance structure. Specific stop-loss protects against high-cost individuals; aggregate stop-loss protects against portfolio deterioration; quota share can provide broader support where justified; and facultative solutions can address unusual risks. The structure should be chosen according to the source of volatility identified in the first layer.

The fourth layer is data and governance. TPA claims feeds, pricing models, underwriting guidelines, recoverability controls, counterparty limits and treaty wording determine whether the theoretical protection operates effectively. This layer also requires clear responsibility between underwriting, actuarial, claims, finance and reinsurance functions.

The fifth layer is outcome monitoring. Performance should be assessed through gross and net loss ratios, high-cost-claim frequency, severity above attachment, reinsurance recovery ratio, renewal adequacy, capital effect, counterparty concentration and turnaround time for recoveries. Metrics should be reviewed together because improvement in one measure can worsen another.

Implementation should proceed in phases. First, the insurer should clean and standardize medical claims data and identify the large-case distribution. Second, it should model alternative specific and aggregate retentions using historical and stressed claims. Third, it should price treaty alternatives and assess capital impact. Fourth, it should negotiate clear wording and counterparty security. Fifth, actual claim recoveries and portfolio results should be compared with modeled assumptions after each renewal cycle.

381 The most important implication for Saudi medical insurance is that optimization begins from a
382 high-retention baseline. Since 98% of health premium was retained in 2024, the framework does not
383 seek to maximize the retention ratio. It seeks to make the retained risk more stable and the transferred
384 risk more economically targeted. This distinction directly aligns reinsurance strategy with medical
385 underwriting and loss-ratio management.



Saudi context: Vision 2030 • National Insurance Sector Strategy • Health insurance regulation • Risk-Based Capital

386
387 *Figure 3. Proposed Saudi Medical Insurance Reinsurance Optimization Framework.*

388 **Table 3. Medical retention decision matrix**

Risk characteristic	Retention implication	Reinsurance response	Underwriting action
Large group, stable claims, low severity concentration	Higher retention may be efficient	Higher specific attachment / limited aggregate cover	Use credible experience and trend
Small SME group, volatile experience	Lower tolerance for random severity	Lower specific attachment	Blend experience with pooled assumptions
Ongoing high-cost members	Higher expected severity	Specific stop-loss / case review	Price continuation risk and verify wording
Broad utilization deterioration	Portfolio-level volatility	Aggregate protection	Review pricing, benefits and provider controls
Rapid medical inflation / new therapies	Uncertain future severity	Stress-tested specific and aggregate layers	Increase trend assumptions and scenario analysis

389 **Table 4. Balanced scorecard for medical reinsurance optimization**

Dimension	Illustrative KPIs	Purpose	Review frequency
Medical underwriting	Gross loss ratio; renewal adequacy; credibility adjustment	Assess primary pricing quality	Monthly / renewal
Severity	High-cost claim frequency; claims above attachment	Measure individual severity risk	Monthly
Aggregate risk	Net loss ratio; portfolio volatility; utilization trend	Measure broad deterioration	Monthly / quarterly

Dimension	Illustrative KPIs	Purpose	Review frequency
Reinsurance	Ceded premium; recovery ratio; recovery turnaround; attachment utilization	Assess treaty value	Quarterly / renewal
Capital & counterparty	Capital relief; reinsurer concentration; aged recoverables	Assess solvency and credit protection	Quarterly
Data quality	TPA reconciliation breaks; outstanding-claim completeness; reporting lag	Assess information reliability	Monthly

11. Discussion

The revised analysis changes the interpretation of reinsurance optimization substantially from the original paper. A property-and-casualty framework emphasizes catastrophe accumulation, large industrial exposures and the possibility of increasing local retention. A medical-insurance framework begins from the opposite structural position: the Saudi health market already retains almost all written premium. The research question therefore becomes how to protect a highly retained portfolio from claim severity and volatility without ceding profitable ordinary medical risk.

This conclusion is strongly aligned with the updated professional profile. The CV identifies a career centered on medical underwriting, including corporate and SME groups, renewal pricing, loss-ratio monitoring, major medical-condition assessment, TPA data, reporting to regulators, portfolio analysis and reinsurance. These are precisely the activities required to implement a data-driven medical reinsurance framework.

Specific stop-loss is likely to be the most intuitive protection against individual severity, but the optimal design is not universal. A smaller SME book may require a lower attachment because one high-cost case can dominate experience. A large corporate or diversified portfolio may tolerate a higher attachment because claims are more predictable at aggregate level. The insurer's capital and appetite should determine how much volatility can be retained.

Aggregate protection addresses a different source of risk and may become more important as medical inflation and utilization change. A portfolio can deteriorate without any one member exceeding the specific threshold. This is particularly relevant in health insurance, where systematic cost trends can affect many insured lives at the same time. Aggregate stop-loss or other portfolio protection can therefore complement specific cover.

The analysis also emphasizes that reinsurance should not become a substitute for underwriting discipline. If a portfolio is poorly priced because claims trend, benefit richness or demographic risk is underestimated, reinsurance may temporarily reduce net volatility but will eventually become more expensive. Sustainable performance requires correct primary pricing first and risk transfer second.

Data quality is a major practical issue. Medical-insurance decisions depend on timely TPA claims experience, paid and outstanding claims, high-cost cases and consistent member data. The updated CV's experience with Saudi NextCare/GlobeMed and medical reporting illustrates why underwriting and claims systems must be connected. A reinsurance program based on incomplete claims development can select inappropriate attachment points and misestimate expected recoveries.

The 98% retention ratio should consequently be interpreted as evidence that medical insurers already carry substantial risk themselves. The policy objective is not to increase that ratio

mechanically. The better measure of success is whether retained claims remain within pricing and capital tolerance while reinsurance efficiently absorbs unpredictable severity. A medical insurer that retains 98% but suffers volatile, underpriced losses is not necessarily stronger than one that cedes slightly more in exchange for materially improved solvency protection.

The framework also supports Vision 2030 through market stability. Stable medical insurers can support broader coverage, predictable employer costs, investment in service quality and better beneficiary experience. Reinsurance contributes indirectly by protecting the insurer's ability to continue accepting and renewing corporate and SME risks even when individual high-cost claims occur.

12. Practical, Regulatory and Research Implications

For chief underwriting officers, retention and reinsurance should be integrated into the medical renewal process. Underwriters should see high-cost cases, outstanding claims, expected trend and potential reinsurance recoveries when reviewing technical results. Renewal decisions should distinguish ordinary utilization from severity events.

For reinsurance managers, treaty design should begin from the actual distribution of medical claims. Attachment points should be tested against historical large cases and stress scenarios rather than selected solely from market practice. The value of aggregate protection should also be evaluated where portfolio-level volatility is material.

For actuarial teams, gross and net pricing models should be connected. Expected claims, trend, credibility and high-cost load should be explicit. The cost and expected benefit of reinsurance should be modeled separately so that underwriting can understand the economics of each structure.

For TPA and claims teams, data timeliness is essential. Paid claims alone may not be sufficient for renewal and reinsurance decisions. Outstanding claims, high-cost case status and expected treatment continuation should be available in a structured form. Data-quality standards between the insurer and TPA can materially improve underwriting accuracy.

For risk and finance functions, the new Saudi Risk-Based Capital environment creates a need to connect medical volatility with capital planning. Stress tests should quantify the gross and net effect of severe claims and aggregate deterioration. Reinsurer default or delayed recoveries should be included in those scenarios.

For the Insurance Authority and wider market, health insurance's 98% retention demonstrates substantial domestic risk bearing. Future market development should therefore focus on technical quality, claims management, data integration, fair pricing and sustainable high-cost risk transfer rather than simply increasing retention percentages.

For researchers, a valuable next step is to analyze de-identified Saudi medical claims to estimate optimal specific attachment points for different group sizes. Additional research could examine how TPA data quality affects underwriting error, how high-cost claims contribute to group loss-ratio volatility, and whether aggregate reinsurance improves capital efficiency for SME medical portfolios.

13. Limitations

The study is conceptual and does not use confidential medical claims or proprietary reinsurance treaties. Consequently, it cannot recommend a numerical attachment point, coinsurance percentage or aggregate threshold for a specific Saudi insurer. These parameters depend on claims distributions, capital, group mix, benefit limits and market pricing.

The 2024 health-insurance figures are market aggregates. A 98% retention ratio does not mean every company or group retains exactly the same proportion, and it does not reveal the distribution of specific reinsurance protection. Similarly, the 83% gross loss ratio is a market-level measure and should not be applied directly to an individual insurer or corporate account.

International health-reinsurance literature is used to support the conceptual treatment of stop-loss protection, but regulatory arrangements differ across countries. The framework must therefore be applied in accordance with Saudi regulations, policy wording and insurer-specific governance. Future empirical work should use de-identified Saudi claims, underwriting and treaty data to validate the proposed relationships.

14. Conclusion

This revised paper positions reinsurance optimization squarely within Saudi medical insurance rather than general insurance. The change is important because the economics of medical risk differ from property and casualty risk and because the updated professional profile is specifically focused on corporate and SME medical underwriting.

Saudi health insurance already operates with very high retention. In 2024, the market recorded approximately SAR 42.25 billion in gross written premiums, SAR 41.40 billion in net written premiums, a 98% retention ratio, approximately SAR 33.8 billion in claims and an 83% gross loss ratio. In the first quarter of 2026, health insurance continued to dominate the market with SAR 18.5 billion in premiums and 14.5 million beneficiaries. These figures show that the sector's strategic question is not how to maximize retention, but how to manage the risk that is already retained.

The paper identifies specific stop-loss and aggregate stop-loss as central medical-insurance tools. Specific cover protects against individual claim severity, while aggregate cover protects against broad deterioration. Quota-share and facultative structures remain relevant where growth, capital or unusual exposures justify them. The correct mix depends on group size, claim severity concentration, paid and outstanding claims, medical trend, benefit design, capital and reinsurance price.

The proposed Saudi Medical Insurance Reinsurance Optimization Framework integrates portfolio diagnosis, retention design, treaty structure, TPA data, pricing, counterparty controls and performance monitoring. Its central principle is targeted transfer: retain predictable and properly priced medical risk while transferring the portion of severity or aggregate volatility that could create unacceptable earnings or capital stress.

This approach is directly consistent with medical underwriting practice. Loss-ratio monitoring, claims-experience review, renewal pricing, TPA reporting and reinsurance analysis are not separate activities; they are parts of one decision system. Strong integration between these functions can improve pricing adequacy and reduce the risk that a few severe cases distort portfolio performance.

For Vision 2030, the implication is that a strong medical-insurance market requires not only premium growth but technically sustainable growth. Reinsurance can support that objective by protecting insurers from high-cost claims while allowing them to continue retaining the majority of ordinary medical risk. The desired outcome is therefore a resilient market with high-quality retention, accurate pricing, disciplined underwriting and selective access to domestic and global reinsurance capacity.

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