Driving Positive Patient Outcomes With Prior Authorization Analytics

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Background

- Prior authorization (PA) plays a vital role in obtaining timely approvals for the provision of specific healthcare services to a patient covered by a health plan. The process is intended to manage the utilization of healthcare resources, reduce overuse or misuse of services, improve the quality of care, and control the overall spending on healthcare
- While PA is meant to ensure appropriate, cost-effective healthcare, it often creates barriers and administrative burdens for providers and causes care delays for patients[1,2]
- According to 2022 physician survey by the American Medical Association (AMA), PA issues are associated with 94% of care delays and contribute to a negative impact on patient clinical outcomes and administrative inefficiencies. The same survey also demonstrated that an overwhelming 80% of physicians reported that PA requirements may lead to abandonment of treatment[3]

Objective

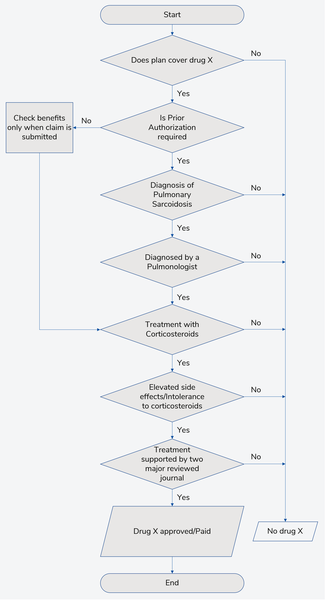
- The objective was to analyze PA data for a specialty product to help generate medical necessity insights along with provider and payer modelling insights that help with reducing drug abandonment and drive patient outcomes

Methodology (1/3)

- A retrospective case-by-case analysis of 5,000 patients' PA submissions for severe and critical autoimmune conditions in neurology, rheumatology, nephrology, pulmonology, and ophthalmology across various payers and providers was performed
- The deidentified PA case packets for each patient were provided by the sponsor's patient hub
- Each PA case packet consisted of the PA forms, start forms, letters of medical necessity, redacted medical records, lab results, and appeal requests that were submitted by the provider's office. The payer response letter to the PA applications for each case in the form of a response letter (approved, denied, withdrawn and closed, or pending) was also included in the PA case packet
- Artificial intelligence (AI) powered natural language processing (NLP) text extraction driven by clinical algorithms for each disease condition was used to transform the unstructured medical records and case forms into structured data
- The clinical algorithms were built using top-down and bottom-up approaches
  - The factors influencing the approval and denial of each case were assessed using a top-down approach, that included the diagnosis of the condition, treatment, disease progression, and payer guidelines that determined the need for the specialty product
  - In the bottom-up approach, the variables for each of the factors considered in the top-down approach were mapped from the medical records and PA forms (Fig 1 and 2)

Fig 1: Algorithm Used for AI/ML-Driven NLP Text Extraction (Top-Down Approach)

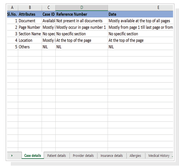
	Data Analysis Steps
Step1	Does the patient's insurance plan cover Drug X, If Yes, Go to step2, otherwise No Drug X
Step2	Is prior authorization required, if Yes, go to Step3, otherwise Check benefits only after the full claim is submitted
Step3	If diagnosis of pulmonary sarcoidosis (PS)/sarcoidosis is present in 1) **Assessment and plan** go to next step4, otherwise go to 2) **Diagnoses** go to next step4, otherwise go to 3) Past Medical History, if present go to next step4, otherwise No Drug X
Step4	Whether PS diagnosed by pulmonologist is present in Drug X Start form(Clinical Information) and check for prescriber's speciality, if present go to next step5, otherwise No Drug X
Step5	Whether PS is treated with corticosteroids(prednisone, methylprednisolone), check in 1) Assessment and Plan, if present go to next step6, otherwise go to 2) Medications, if present go to next step6, otherwise go to 3) Medical History, if present go to next step6, otherwise go to 4) Allergies, if present go to next step6, otherwise No Drug X
Step6	History of corticosteroid use 1) Corticosteroid use fail a) Check in **Review of Systems** for all or some of these symtoms: Cough Shortness of breath Chest pain Night sweats Fatigue Wheezing Feeling congestion Weight gain b) If present go to next step7, otherwise go to **Allergies** and check for corticosteroids(prednisone, methylprednisolone) c) If present in **Allergies**, go to next step7, otherwise check for intolerance to corticosteroids in **Plan of care** d) If intolerance is present in Plan of Care, go to next step7, otherwise go to **Start form** e) Check for intolerance to corticosteroids under History of corticosteroid use, if present go to next step7, otherwise check for corticosteroid use contraindicated in Start form f) If present go to next step7, otherwise No Drug X.
Step7	Treatment supported by journals. If two major peer reviewed journals attached along with the above conditions satisfies, then Drug X approved, otherwise denied



Methodology (2/3)

Fig 2: Algorithm Used for AI/ML-Driven NLP Text Extraction (Bottom-Up Approach)

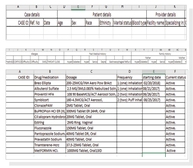
Document Level Attributes



Key Operations:

- Structuring form information
- Provides an NLP-supporting format
- Provides metadata for the classification of form content

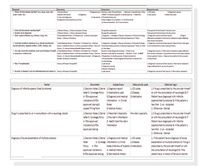
Patient Level Attributes



Key Operations:

- Patient level information
- Granular level classification of medical information
- Feeds into the NLP engine as training data

Logic Framework

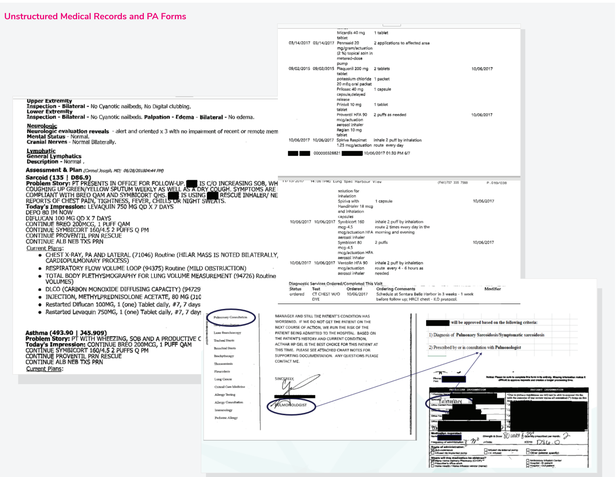


Key Operations:

- Medical SME-curated situation-outcome model
- Presents different scenarios as testing rules for the NLP engine

Fig 3: Algorithm Used for AI/ML-Driven NLP Text Extraction (Bottom-Up Approach)

Unstructured Medical Records and PA Forms



AI-Driven NLP Text Extraction

Structured Data

Case ID	Primary diagnosis	Payer	Is the claim approved?	Reason for denial	Were visit notes/chart notes provided?	Was a letter of medical necessity provided?	Whether the patient is in active flare?	Was the patient on steroids?	Name of the drug and dosage of the drug (Format: Drug name - Dose)	Is the patient currently on steroids?	Name of the drug and dosage of the drug (Format: Drug name - Dose)	Is it a chronic therapy?	Duration of the therapy	Has the patient failed steroids in the past?	Reason of steroid failure (specific to drug)	Was the patient on DMARDs/biologics?
56125	Systemic		No	Pt does not	No	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
56126	Rheumatoid		No	Drug X is not	No	No	Unknown	Yes	Unknown	No	Unknown	NA	Yes	Only high	Yes	
58349	Pulmonary		No	Drug X fail	No	No	Yes	Yes	Unknown	Unknown	N/A	N/A	N/A	Unknown	N/A	No
59210	Rheumatoid		Unknown	Unknown	No	No	Unknown	Yes	Unknown	Unknown	Unknown	Unknown	Unknown	Yes	Intolerant to	Unknown
60026	Systemic		Unknown	Unknown	Yes	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Unknown	N/A	Yes	Got relief	Yes
60675	Rheumatoid		No	Medication	Yes	Yes	Yes	Yes	Prednisone -	No	Not	Not	Not	Yes	Had been	Yes
63318	Polymyositis		Unknown	N/A	Yes	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Yes	Unknown	No	N/A	Yes
63364	Psoriatic		yes	Conditions	No	No	Yes	Yes	Prednisone -	Unknown	N/A	N/A	Yes	Yes	Continued to	Yes
65003	Rheumatoid		No	Patient's	Yes	Yes	Yes	Yes	Prednisone -	Yes	Prednisone -	No	1 month	Yes	No response	Yes
64976	Rheumatoid		No	Coverage	Yes	Yes	Unknown	Yes	Prednisone -	Yes	Prednisone -	Unknown	NA	Yes	little	Yes
65004	Rheumatoid		Unavailable	Not	Yes	No	Yes	Yes	Prednisone-	Yes	Prednisone-	Unavailable	Unavailable	Yes	Inadequate	Yes
65110	Rheumatoid		No	Coverage is	No	No	Unavailable	Unavailable	Not	Unavailable	Not	Not	Unavailable	Not	Not	Unavailable
65405	Rheumatoid		No	Not a medical	Yes	Yes	Yes	Yes	Unavailable	No	NA	No	Unavailable	Yes	Unavailable	Yes
66051	Rheumatoid		No	Coverage is	No	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Unavailable	Not	Yes	Inadequate	Yes
63347	Seropositive		Unavailable	Not	Yes	Yes, but not	Yes	Yes	Medrol - 4mg	Yes	Medrol - 8mg	Yes	5 months	Yes	Unable to	Yes
63391	Rheumatoid		Unknown	N/A	Yes	No	Unknown	Unknown	NA	Yes	Prednisone -	Unknown	NA	Yes	NA	Unknown
63521	Seropositive		Unknown	N/A	Yes	Yes	Unknown	Yes	Unknown	Yes	Prednisone	Yes	Unknown	Unknown	NA	Yes
63558	Rheumatoid		No	Coverage for	Yes	Yes	Yes	Yes	Unknown	Yes	Medrol -4mg	unknown	unknown	No	N/A	Yes
63682	Wegener's		Unknown	N/A	No	No	Unknown	No	N/A	No	N/A	N/A	N/A	No	N/A	Yes
63977	Rheumatoid		Unknown	IAF Drug X Sat	Yes	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Yes	Unknown	Yes	Difficult to	Yes
64113	Wegener's		No	Coverage is	Yes	No	Yes	Yes	Prednisone -	No	NA	No	Unknown	Yes	Unknown	Yes
63656	Polymyalgia		Unavailable	Unavailable	Yes	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Yes	6 years	Yes	Ineffective,	No
64525	Seronegative		No	Not a medical	Yes	No	Yes	Yes	Prednisone-	No	NA	Unknown	Unknown	Yes	Side effects	Yes
65037	Ankylosing		Unknown	Unknown	Yes	No	Yes	Yes	Prednisone -	Yes	Medrol - 4 mg	No	N/A	Yes	Weight gain	Yes
59291	Juvenile		Yes	N/A	Yes	No	Yes	Yes	Unknown	Unknown	N/A	yes	7 years	YES	Steroids	Yes
62170	Systemic		Unknown	Unknown	Yes	No	Yes	yes	Yes	Prednisone -	Yes	Prednisone -	2 years	No	N/A	Yes
62331	Rheumatoid		Unknown	N/A	Yes	No	Yes	Yes	Prednisone -	Yes	Prednisone -	Yes	Unknown	No	N/A	Yes
63490	Neurotic		N/A	Not a medical	Yes	No	Yes	Yes	Prednisone	Yes	Prednisone	Yes	3 months	No	NA	L
59453	FSGS with IgA		N/A	Not a medical	Yes	No	Yes	Yes	Prednisone	No	N/A	Yes	60 days	Yes	stopped	L
61439	Nephrotic		N/A	Drug X get is	Yes	Yes	Yes	No	NA	No	NA	NA	NA	NA	Allopurinol	Unknown for
63533	Primary FSGS		N/A	Coverage is	Yes	No	No	N/A	No	N/A	N/A	N/A	N/A	N/A	Losartan	Unknown
61981	Proteinuria in		N/A	Coverage is	Yes	No	Unavailable	Unavailable	Yes	levothyroxine	Unavailable	Not	Yes	Intolerant to	ACE/ARB	Due to
58617	Proteinuria in		N/A	Drug X get is	No	Yes	Yes	Yes	Prednisone -	Yes	Prednisone -	Yes	7 months	Yes	Condition	Cellcept,
59533	Proteinuria in		N/A	The Clinical	Yes	Yes	Yes	Yes	Prednisone-	Yes	Prednisone-	Yes	over 1 year	Yes	Patient	Cellcept, Lasix,
61811	Focal		NA	Medication	No	Yes	Yes	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Yes	Unavailable	Unavailable	Unavailable
61868	Focal		NA	Medication	No	No	Yes	Unavailable	Unavailable	N/A	Unavailable	Unavailable	Yes	Unavailable	Unavailable	N/A

Methodology (3/3)

- A qualitative analysis of the machine-generated structured data was conducted by medical experts. Each patient's clinical information, including signs and symptoms of disease progression, laboratory results, comorbidities, treatment history, and dosing, were reviewed
- The safety and effectiveness of the early-line therapies were assessed to determine the comorbidities and their relationship to the therapies and the refractory or progressive status of the given condition
- A quantitative analysis of the structured data was performed to classify variables and map cause-and-effect for the approval and (or) rejection of each case to model payer behavior through the number of denied and approved claims
- The healthcare resource utilization for each patient across the approved and denied cases were assessed. The cost of healthcare resource utilization for each disease condition was mapped from the secondary research data

Results

- Case-by-case medical necessity insights, detailed reasons for denial or approval from payers, and justifications in letters of medical necessity were reported. Actionable recommendations were generated

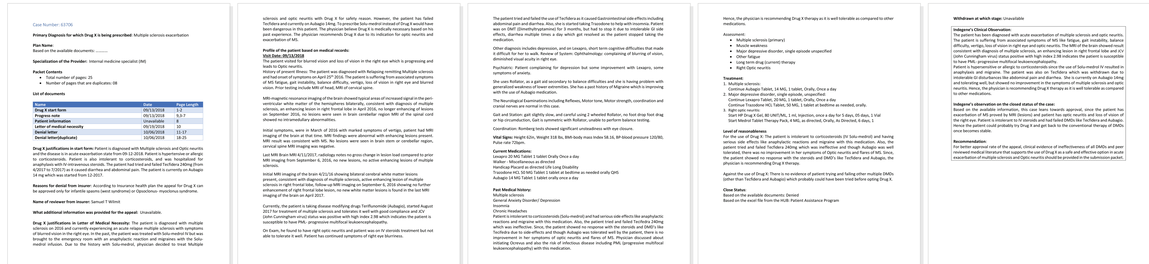
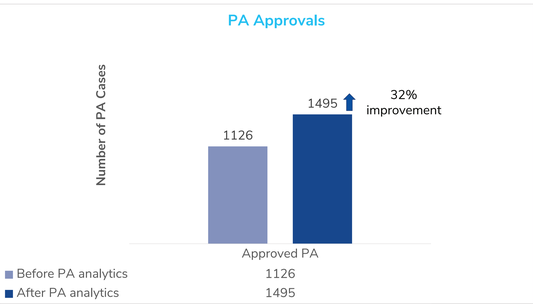


Table 1: Healthcare Resource Utilization and Costs for Approved and Denied Cases

Resource Utilization	Approved Cases	Denied Cases
Prescription Drug Use:		
• Biologic disease-modifying antirheumatic drugs (DMARDs)	6.50%	9.30%
• Anti - tumor necrosis factors (TNF)	4.70%	9.40%
Mean Total Medical Costs (Annual)	**$14,037**	**$22,974**
• Inpatient	$716	$813
• Outpatient	$11,697	$19,968

- Around 6.5% of patients with approved cases had biologic disease-modifying antirheumatic drugs usage, compared to 9.3% of those with denied cases
- Patients with approved cases incurred $14,037 in mean total annual medical costs compared to $22,974 for those with denied cases

Fig 4: PA Approvals Before and After PA Analytics



- We observed a 32% improvement in PA approval as a result of PA analytics

- The medical necessity and payer modeling insights and case-by-case actionable recommendations helped a leading US-based pharmaceutical enterprise achieve a 32% higher PA approval rate than the rate prior to applying PA analytics
- A reduction in unwarranted rejections of clinically valid PA submissions may decrease healthcare utilization and costs
- The NLP-driven clinical analytic insights enabled an improvement in PA approval rates, thus ensuring faster and greater patient access to drugs

1. 2022 AMA prior authorization (PA) physician survey. (American Medical Association, 2022) https://www.ama-assn.org/system/files/prior-authorization-survey.pdf
2. Automation of the Prior Authorization Process. CAQH. CAQH-CORE-Automating-Prior-Authorization.pdf
3. Prior Auth Comprehensive Report. https://www.ehidc.org/sites/default/files/resources/files/Prior%20Auth%20Comprehensive%20Report%20Feb%202019.pdf

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