

# Staffing Optimization for Pre-Arrival Scheduling Across the IL and WI Markets

Nathan Schaaf, MS  
Pre-Arrival Business Operations  
Advocate Health  
Charlotte, U.S.A  
nathan.schaaf@advocatehealth.org

**Executive Summary**—This analysis proposes a streamlined staffing and scheduling model for the Pre-Arrival Scheduling team within Advocate Health’s Revenue Cycle, developed following the integration of Atrium Health and Advocate Aurora into a unified enterprise structure. Using historical call volume, average handling time, utilization trends, and Erlang C staffing calculations, the assessment identifies understaffing during peak periods in the IL Market and overstaffing in the WI Market. The optimized model introduces standardized full-time and part-time staffing cohorts aligned to peak demand, reduces weekday and Saturday shift start times from thirteen to two, ensures all employees take a 30-minute unpaid lunch, and provides full-time employees with consistent back-to-back rest days. These changes simplify schedule management, support policy compliance, and significantly enhance both patient access and teammate experience. The proposed model also delivers approximately \$1.08M in annual operating expense savings, demonstrating meaningful financial stewardship while improving service-level performance across both markets.

**Keywords**—*Pre-Arrival Scheduling; Call Center Staffing; Erlang C; Workforce Optimization; Snowflake; Genesys; Operational Efficiency, Revenue Cycle; Workforce Management; Scheduling Optimization; Staffing Model; Python Automation*

## I. INTRODUCTION

Call centers in healthcare play a critical role in patient access and scheduling. Staffing these centers effectively is essential to maintain service levels and operational efficiency. Traditional approaches often lead to overstaffing during low-demand periods or understaffing during peak hours, resulting in increased costs and reduced patient satisfaction. This paper introduces a systematic method to calculate staffing needs and allocate resources using Erlang C modeling and Python-based optimization, focusing on the Pre-Arrival Scheduling team’s Illinois (IL) and Wisconsin (WI) markets within the Revenue Cycle department at Advocate Health.

Following the 2022 merger of Atrium Health and Advocate Aurora Health, the newly formed Advocate Health organization established enterprise-wide operational departments to standardize processes and improve efficiency across multiple regions. The Pre-Arrival Scheduling team is part of this transformation, tasked with ensuring consistent patient scheduling experiences across diverse markets. This analysis leverages historical call data, advanced forecasting techniques, and optimization logic to recommend staffing strategies that align with service level goals while accommodating operational constraints unique to each market.

## II. HOURS OF OPERATION

Upon review of available data spanning Nov. 2024 through Dec. 2025, it is apparent that the IL Market and WI Market should be evaluated separately. Each represents a distinct geographic region, which in turn represents unique cultures, state regulations, and other aspects that impact customer behaviors. While each market’s operational goals

are set at the same level, their performance differences are apparent as IL falls short of goal adherence while WI tends to surpass expectations. This can be contributed to call volumes, staffing, and operational process difference, of which the staffing will be addressed later in this paper.

Both markets display similar incoming call daily distributions and operate under the same hours of Monday through Friday, 8am to 7pm and Saturday 7:30am to 4pm CST.

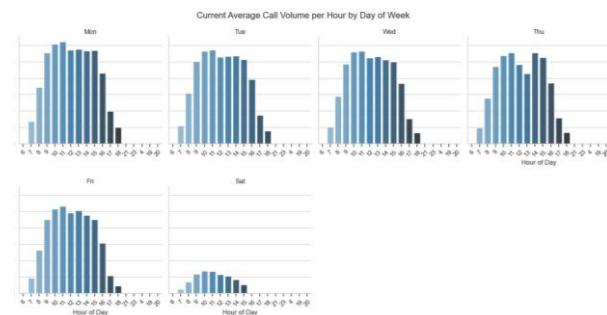


Fig. 1. Each subplot represents a single weekday and displays the average number of calls received during each hour of the day for the IL Market.

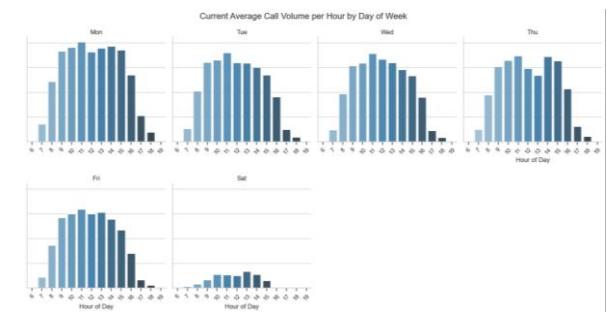


Fig. 2. Each subplot represents a single weekday and displays the average number of calls received during each hour of the day for the WI Market.

Fig. 1 shows the IL Market distribution, and you can see that call volumes here average more per hour than the WI Market shown in Fig. 2. Less than 2% of incoming calls occur within the opening and closing hours of each weekday. We hypothesized that a 2-hour reduction of operations, starting an hour later and ending an hour earlier, will have a negligible impact on call volume and thereby a negligible impact on operational metrics. We ran simulations on 9 different hourly schedules and confirmed our hypothesis. The Cost per Call metric showed a favorable decrease of approximately \$1.08M annually as a result of the proposed operating hours, and was the only metric impacted by the change.

**This analysis recommends the following Hours of Operation for both the IL Market and WI Market:**

- Weekdays 8am – 6pm
- Saturday 7:30am – 4pm

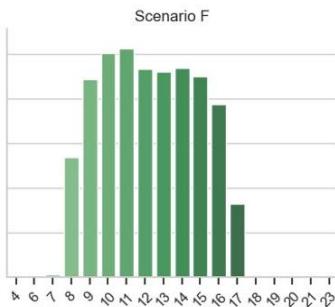


Fig. 3. This figure illustrates projected average hourly call volumes for the IL Market following the revised operating hours.

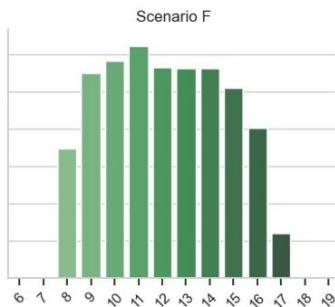


Fig. 4. This figure illustrates projected average hourly call volumes for the WI Market following the revised operating hours.

This change will have minimal impacts on current operating metrics but will reduce the cost per call. Fig. 3 shows the forecasted daily average call distribution for the IL Market while Fig. 4 displays the same for the WI Market. It is reasonable to assume that the calls which occurred during the opening and closing hours will be redistributed throughout the day as the business will not be lost due to this scheduling change.

### III. STAFFING & SCHEDULING

Effective staffing requires a data-driven approach that aligns workforce allocation with actual demand patterns. This analysis begins by collecting historical call data from Genesys, including offered and answered sessions, average handling time (AHT), and call arrival rates. These metrics were extracted via Snowflake SQL pipelines and aggregated by day and hour to identify peak demand periods.

To determine the number of agents required to meet service level targets, the Erlang C formula was applied. Erlang C calculates the probability of delay and required staffing based on call load (erlangs), AHT, and target service level ( $\blacksquare\%$  of calls answered within  $\blacksquare$  seconds). The calculation incorporates shrinkage and occupancy adjustments to reflect real-world conditions, ensuring that scheduled staff can absorb breaks, meetings, and other non-productive time.

Utilization was computed as the ratio of productive time to scheduled time, providing insight into efficiency and identifying periods of under- or over-staffing. Average handling time was derived from agent talk, hold, and wrap-up durations, forming the basis for workload estimation.

Staffing constraints were then applied: full-time employees are limited to 40 hours per week, while part-time employees work between 24 and 30 hours per week. Additional rules include ensuring that full-time Saturday workers have Monday off and minimizing overstaffing during midweek periods. Also, all staff will take a  $\blacksquare$  minute  $\blacksquare$  lunch, regardless of full- or part-time status.

The current workforce includes a wide range of non-standard hour allocations. The FTE report shows several employees working fractional loads such as  $\blacksquare$ ,  $\blacksquare$ ,  $\blacksquare$ ,  $\blacksquare$ , and  $\blacksquare$  FTE, mostly within the WI Market. These irregular weekly hour patterns introduce inconsistency in available labor capacity, complicate schedule design, and make it difficult to align staffing with peak demand periods. This variability is a driver of the inefficiencies observed in the current scheduling model and reinforces the need for standardized hour structures in the optimized plan.

Finally, optimization logic was implemented using Python to balance full-time and part-time cohorts. The strategy sets Friday's peak demand as the baseline for full-time coverage across Tuesday through Friday, splits Saturday coverage between full-time and part-time staff, and uses part-time employees to fill Monday gaps. This approach achieves service level compliance while reducing unnecessary labor costs and maintaining scheduling flexibility. Because many staffing combinations can meet the target, the Python output serves as an initial plan that can be fine-tuned as needed.

**Current State of Scheduling:** At present, the call center operates with 13 different shift starting times: 7:00 AM, 7:30 AM, 7:45 AM, 8:00 AM, 8:15 AM, 8:30 AM, 9:00 AM, 9:30 AM, 10:00 AM, 10:10 AM, 10:30 AM, 11:00 AM, and 1:15 PM. This high variability in start times adds complexity to workforce management and may contribute to inefficiencies in meeting peak-hour demand.

#### A. IL Market

The IL Market currently has  $\blacksquare$  FTEs,  $\blacksquare$  of whom work less than 40 hours per week. They average  $\blacksquare$  calls per hour and have an average handling time of  $\blacksquare$  minutes. The current utilization is  $\blacksquare\%$ .

Fig. 5 displays each hour of each day and  $\blacksquare$ .  
 $\blacksquare$ .

This plot, along with the moderate utilization rate, suggests under staffing during the peak demand times of 10am to 4pm.

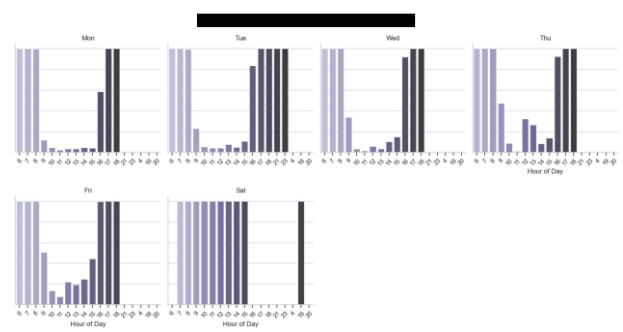


Fig. 5. IL Market multi-panel plot illustrating  $\blacksquare$  for each hour of each day.

This analysis recommends the following Staff & Schedule for the IL Market:

- [REDACTED] Full-time (FT); 40hr x 5d
- [REDACTED] Part-time (PT); 8hr x 3d
- [REDACTED] Part-time (PT); 6hr x 4d
- Weekday Shift 1 starts 8:00am
- Weekday Shift 2 starts 9:30am
- Saturday Shift 1 starts 7:30am
- Saturday Shift 2 starts 8:30am

1) Table 1 displays the recommended staff per day and includes a [REDACTED] shrinkage.

TABLE I. IL MARKET STAFFING

Group	Day of Week					
	Mon	Tue	Wed	Thu	Fri	Sat
FT-A	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
FT-B	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-A	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-B	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-C	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-D	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<b>TOTAL</b>	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<b>Peak Demand<sup>a</sup></b>	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

<sup>a</sup> Peak Demand is the calculated staff needed to handle the hourly max. call volume for that day, including [REDACTED] % shrinkage

2) Table 2 shows the shifts and staffing requirements for each.

TABLE II. IL MARKET SHIFTS

Day	Shift	Time	Staff
Mon – Fri	FT (1)	8am – 4:30pm	[REDACTED]
Mon – Fri	FT (2)	9:30am – 6pm	[REDACTED]
Mon, Tue, Thu	PT-A	9:30am – 6pm	[REDACTED]
Mon, Tue	PT-B	9:30am – 6pm	[REDACTED]
Mon, Wed, Thu	PT-C	9:30am – 4pm	[REDACTED]
Mon, Tue, Wed, Fri	PT-D	9:30am – 4pm	[REDACTED]
Sat	FT	7:30am – 4pm	[REDACTED]
Sat	PT-B	7:30am – 4pm	[REDACTED]
Sat	PT-C	8:30am – 3pm	[REDACTED]

a. [REDACTED] on Mon, [REDACTED] Tue - Fri

### B. WI Market

The WI Market currently has [REDACTED] FTEs, [REDACTED] of whom work less than 40 hours per week. They average [REDACTED] calls per hour and have an average handling time of [REDACTED] minutes. The current utilization is at [REDACTED] %.

This market performs much better regarding service level than the previous market as seen in Fig. 6. However, the low utilization rate along with other metrics suggests this market is over staffed to meet their goals.

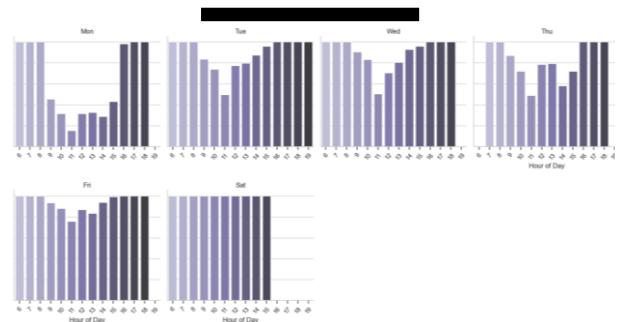


Fig. 6. WI Market multi-panel plot illustrating [REDACTED] for each hour of each day.

This analysis recommends the following Staff & Schedule for the WI Market:

- [REDACTED] Full-time (FT); 40hr x 5d
- [REDACTED] Part-time (PT); 8hr x 3d
- Weekday Shift 1 starts 8:00am
- Weekday Shift 2 starts 9:30am
- Saturday Shift starts 7:30am

1) Table 3 displays the recommended staff per day and includes a [REDACTED] % shrinkage.

TABLE III. WI MARKET STAFFING

Group	Day of Week					
	Mon	Tue	Wed	Thu	Fri	Sat
FT-A	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
FT-B	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-A	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-B	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
PT-C	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<b>TOTAL</b>	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<b>Peak Demand<sup>a</sup></b>	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

<sup>a</sup> Peak Demand is the calculated staff needed to handle the hourly max. call volume for that day, including [REDACTED] % shrinkage

2) Table 4 shows the shifts and staffing requirements for each.

TABLE IV. WI MARKET SHIFTS

Day	Shift	Time	Staff
Mon – Fri	FT (1)	8am – 4:30pm	■
Mon – Fri	FT (2)	9:30am – 6pm	■■■
Mon, Tue, Thu	PT-A	9:30am – 6pm	■
Mon, Wed	PT-B	9:30am – 6pm	■
Mon, Wed, Fri	PT-C	9:30am – 6pm	■
Sat	FT	7:30am – 4pm	■
Sat	PT-B	7:30am – 4pm	■

a. ■ on Mon, ■■ Tue - Fri

#### IV. BREAKS & MEALS

Effective break and lunch scheduling is a critical component of workforce management, as off-phone intervals directly influence staffing coverage, service availability, and operational stability. Variability in the timing and overlap of these intervals can create unanticipated reductions in active staffing, especially during high-demand periods, leading to avoidable performance degradation. To address these challenges, a standardized break and lunch structure was developed to reduce variability, strengthen coverage during peak call-volume windows, and support more predictable performance outcomes.

##### A. IL Market

The IL Market exhibits substantial variability in the timing of breaks and lunches, resulting in inconsistent staffing coverage throughout the day. Analysis of the current off-phone patterns indicates significant overlap between break and lunch intervals, driven largely by the absence of standardized scheduling rules. Under the proposed model, all 8-hour staff members receive two ■-minute breaks and one ■-minute lunch. All lunches occur within a standardized window from 11:00am to 2:00pm.



Fig. 7. This figure overlays the current break and lunch patterns with the proposed standardized schedule.

Fig. 7 shows a comparison of the current and proposed schedules, highlighting several operational challenges. First, the existing pattern shows a large cluster of staff taking breaks or lunches simultaneously, particularly during the 11:00am – 12:00pm hour and more broadly across the 10:00am – 4:00pm peak-volume window. These overlapping off-phone periods create pronounced dips in active staffing, reducing available capacity during the highest-demand intervals. As a result, performance metrics such as Average Handling Time (AHT),

Average Speed to Answer (ASA), and overall Service Level show measurable degradation during these periods.

Second, the inconsistent timing of current breaks and lunches introduces unpredictability into the system, making it difficult to align staffing supply with forecasted demand. Variability of this kind increases the risk of coverage gaps, reduces workforce stability, and limits the team's ability to maintain consistent performance during fluctuations in call volume.

The proposed schedule mitigates these issues by distributing breaks more evenly throughout the day and ensuring that lunches fall within a defined time window. Implementing this structure is expected to stabilize staffing coverage during peak-demand periods, reducing the occurrence of simultaneous off-phone intervals, and improve operational performance across core metrics.

##### B. WI Market

The WI Market demonstrates fewer extreme spikes in break and lunch activity compared to the IL Market; however, notable variability remains in the timing and overlap of off-phone intervals. Under the proposed standardized scheduling model, all 8-hour staff members receive two ■-minute breaks and one ■-minute lunch, with the lunch period also fixed within the 11:00am – 2:00pm window.

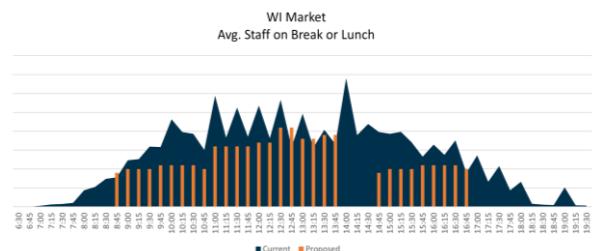


Fig. 8. This figure overlays the current break and lunch patterns with the proposed standardized schedule.

Although the current WI schedule exhibits a smoother distribution of off-phone periods relative to IL, the data still reveal inconsistent start times that generate unpredictable dips in staffing during key demand intervals. These variability-driven reductions in active coverage can constrain available capacity during high-volume hours, even within a generally higher-performing team. Clusters of staff taking breaks or lunches simultaneously continue to appear during the highest-volume periods, limiting the team's ability to fully align staffing supply with call-volume demand.

The proposed standardized schedule addresses these challenges by distributing breaks and lunches more evenly and enforcing a consistent midday lunch window. This approach reduces the likelihood of simultaneous off-phone intervals and increases the predictability of staffing throughout the operating day.

#### V. CONCLUSION

This analysis demonstrates significant differences between the current staffing and scheduling model and the proposed optimized approach. Currently, both the Illinois (IL) and Wisconsin (WI) markets operate with a high degree of

variability in shift start times, 13 different start times ranging from 7:00 AM to 1:15 PM, creating complexity in workforce management and inefficiencies in meeting peak-hour demand. Additionally, the existing staffing levels do not align with actual call volume patterns: the IL Market experiences understaffing during peak hours, resulting in missed service level targets, while the WI Market shows signs of overstaffing, reflected in low utilization rates.

The proposed model simplifies scheduling by reducing shift variability to two weekday start times while improving predictability and operational control. Staffing recommendations are based on Erlang C calculations, utilization analysis, and optimization logic, ensuring that full-time and part-time allocations match peak demand while adhering to constraints such as weekly hour limits and the requirement for Saturday workers to have Monday off. For the IL Market, the plan increases full-time coverage during peak hours and introduces targeted part-time cohorts to absorb Monday and Saturday variability. For the WI Market, the plan reduces overall headcount to align with lower call volumes, improving utilization without compromising service level performance.

This proposal requires all staff, regardless of full-time or part-time status, to take a [REDACTED]-minute [REDACTED] lunch break. This alleviates ambiguity in recent corporate policy updates, ensures compliance with state labor laws, promotes employee well-being by encouraging healthy breaks, and simplifies schedule management by standardizing break practices across all cohorts. Furthermore, the proposal improves work-life balance for full-time employees by transitioning from alternating rest days to guaranteed back-to-back rest days, a highly positive outcome that supports employee satisfaction and retention.

By transitioning from a fragmented scheduling structure to a streamlined, data-driven staffing model with clear break policies and improved rest day patterns, Advocate Health can achieve better service level compliance, reduce labor costs, and enhance operational efficiency across both markets. This approach supports the organization's enterprise-wide standardization goals following the Atrium–Advocate merger and establishes a scalable framework for future workforce planning initiatives.

#### REFERENCES

- [1] Snowflake Notebook: "Scheduling Staff Optimization – WI Market," Advocate Health Revenue Cycle, accessed Jan. 2026.
- [2] Snowflake Notebook: "Scheduling Staff Optimization – IL Market," Advocate Health Revenue Cycle, accessed Jan. 2026.
- [3] NEXUS\_GENESYS\_PROD.PUBLIC.CONVERSATIONS, Advocate Health Data Warehouse.

- [4] NEXUS\_GENESYS\_PROD.PUBLIC.SESSION\_SUMMARY, Advocate Health Data Warehouse.
- [5] MDP\_EBI\_ERP\_WS.SHAREHR\_PTACCESS\_PROD.V\_WORKER\_S\_POSITIONS\_PTACCESS, Advocate Health Data Warehouse.
- [6] Snowflake Shared Workspace: "MW Optimal Scheduling Hours," accessed Jan. 2026.
- [7] SharePoint Library: "2026Q1 Midwest Scheduling Operational Improvement Plan," Advocate Health Revenue Cycle, accessed Jan. 2026.

#### APPENDIX

These tables show the quantity of staff off phone for each break and lunch period. Breaks are in 15-minute blocks and lunch is in 30-minute blocks from 11am to 2pm.

TABLE V. IL MARKET BREAK & LUNCH

Time	SHIFT						
	FT(1)	FT(2) Mon	FT(2) Tu-Fr	PT-A	PT-B	PT-C	PT-D
8:00 am							
8:15 am							
8:30 am							
8:45 am							
9:00 am							
9:15 am							
9:30 am							
9:45 am							
10:00 am							
10:15 am							
10:30 am							
10:45 am							
11:00 am							
11:30 am							
12:00 pm							
12:30 pm							
1:00 pm							
1:30 pm							
2:00 pm							
2:15 pm							
2:30 pm							
2:45 pm							
3:00 pm							
3:15 pm							
3:30 pm							
3:45 pm							
4:00 pm							
4:15 pm							
4:30 pm							
4:45 pm							
5:00 pm							
5:15 pm							
5:30 pm							
5:45 pm							
6:00 pm							

TABLE VI. WI MARKET BREAK & LUNCH

Time	SHIFT					
	FT(1)	FT(2) Mon	FT(2) Tu-Fr	PT-A	PT-B	PT-C
8:00 am						
8:15 am						
8:30 am						
8:45 am						
9:00 am						
9:15 am						
9:30 am						
9:45 am						
10:00 am						
10:15 am						
10:30 am						
10:45 am						
11:00 am						
11:30 am						
12:00 pm						
12:30 pm						
1:00 pm						
1:30 pm						
2:00 pm						
2:15 pm						
2:30 pm						
2:45 pm						
3:00 pm						
3:15 pm						
3:30 pm						
3:45 pm						
4:00 pm						
4:15 pm						
4:30 pm						
4:45 pm						
5:00 pm						
5:15 pm						
5:30 pm						
5:45 pm						
6:00 pm						